American Machinist

SEPTEMBER 23, 1957 PRICE 75 CENTS

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

America's Automatic Factory

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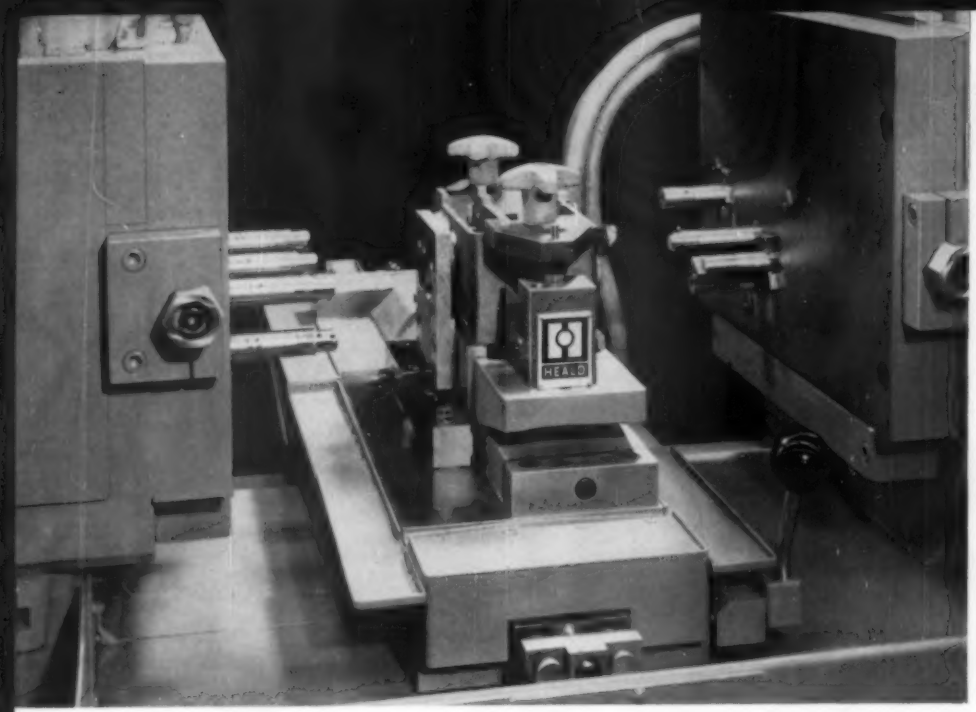
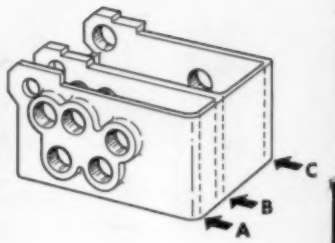
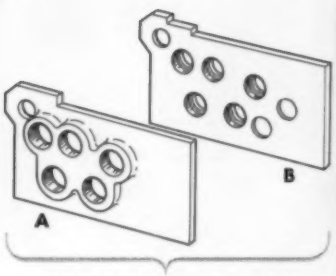
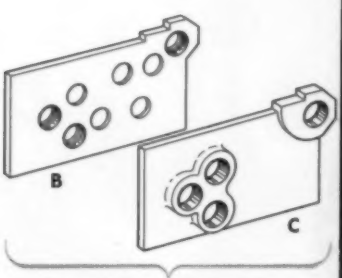






Holes Borized on Left End



Holes Borized on Right End

HOW TO BORIZE
MULTIPLE HOLES
ON CLOSE CENTERS
in one fully-automatic cycle!

New Multi-Spindle Boringheads make it as easy as A, B, C

PRECISION boring of closely-spaced multiple holes used to be a slow and laborious job — done one-at-a-time on large, costly equipment that required highly-skilled operators. But not any more!

The new Heald Multi-Spindle Boringheads put high-precision, close-center borizing on a mass-production basis. Used with any Heald Bore-Matic, this Multi-Spindle head will precision Borize any practical number of holes, on centers as close as ¾", at a single pass of the table — and duplicate the same operation again and again.

A Multi-Spindle head unit consists of a supporting frame which mounts interchangeable spindle plates, precision bored to receive the required number and arrangement of miniature precision Red-Head boringheads.

Any or all boringheads, including the smallest size, ¾", can be provided with hydraulic cross-feed units operated from a single cylinder. Job changeover is simply a matter of switching spindle plates, and mounting the miniature boringheads required.

For the complete story on this important new development, send for Bulletin 2-021-022-1 Issue 1.

HERE'S A GOOD EXAMPLE:

The Model 122 Bore-Matic shown above is equipped with Multi-Spindle Boringheads on both ends, to precision finish close-center bores in a small transmission housing. Each head consists of a group of miniature, precision Red-Head boringheads mounted on spindle plates that are jig bored for precise location of each Red Head. The setup shown, with 5 heads on the left and 4 on the right, is designed to bore and face 17 different holes. All operations are performed in a single, fully automatic cycle, with just one chucking of the work, and no indexing. The surfaces finished at each end of the machine are shown in the "exploded" part drawings above.

IT PAYS TO COME TO HEALD

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METALWORKING PRODUCTION

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American Machinist chips

Answer to Russia... When we published the much talked about article on Russia's automatic bearing plant (*AM*—Jan 14 '57, p147), we knew there were some plants in this country that were even better. In fact, we've been trying to get the story on these plants for several years. Now, because of the interest aroused by our Russian Report, Timken has decided to let the press see and talk about their famous Bucyrus plant on exactly the same basis that we were permitted to report the Russian plant (this included complete freedom to take pictures, go anywhere in the plant, and ask any questions). As this page goes to press we haven't been in the Timken plant yet, but we are holding eight pages open for the story (the same space we gave the Moscow plant) and you'll find our report on page 153.

Cutting Problem... Laminated plastics, such as Formica, present a tough shearing problem. Best results are obtained by shearing in a press brake with a special parting knife similar to the type used for paper cutting. A hard maple strip is inserted in the filler block to act as an anvil for the knife so proper penetration and fracture of the sheet can take place (see picture below).

Conventional shears won't work on Formica—they leave cracked or "crazed" edges. Four press brakes with 65-ton bending capacity were built by Cincinnati Shaper for the job. Three are used to square the edges and trim flash from the large sheets as they come from the sheet presses. The fourth is used to shear the large sheets to desired sizes. Note that the filler block is tapered on both sides to facilitate gaging. The press brakes have 10-ft beds and electric clutch control.

Coming... *AM* for Oct 7 will be highlighted by a Special Report on the design of tools for cold extrusion and the second part of our series on the new tooling for the '58 cars. Among the articles you'll find details on the new extrusion press that excited such interest when reported in Spot News recently, and an interesting example of adhesive assembly.

Cover...
Shearing laminated plastic at the Evendale Plant of Formica Corp on press brakes built by Cincinnati Shaper Co. Details at left.

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Helixform*—a new method for bevel gear production!

The new No. 112 Hypoid Helixform Gear Finisher assures improved quality and increased production on spiral bevel and hypoid non-generated ring gears up to 10½" in diameter, and 2½ DP such as employed in passenger car axles.

The Helixform Cutting Method used on this machine offers these advantages:

Conjugate tooth surfaces, minimized gear development, complete control of tooth bearing, and greater adjustability in final assembly.

We will be glad to send a bulletin giving further details on request. Ask for literature on the No. 112 Hypoid Helixform Gear Finisher and the companion No. 112 Hypoid Gear Rougher. Write for it today.

*Trade-Mark

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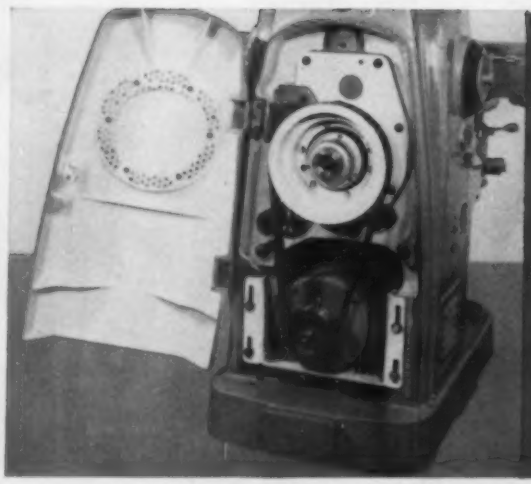
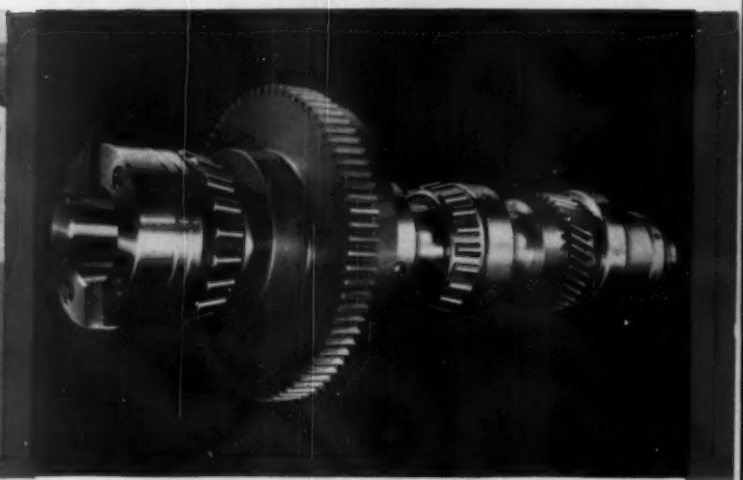
at the Smartest Buy
in 3 to 7½ hp Milling Machines

CINCINNATI



Cradle type mounting for spindle drive motor greatly simplifies removal and servicing of the motor.



Anti-friction mounting with center support for the heavy spindle assembly, smoothly transmits maximum cutting power.

CINCINNATI No. 2 MI MILLING MACHINE
Catalog No. M-1995.

Brief Specs CINCINNATI ML and MI Milling Machines

Size	No. 2 ML		No. 2MI			No. 3MI	
Style	Plain	Univ.	Plain	Univ.	Vert.	Plain	Univ.
Range: Longitudinal	28"	28"	28"	28"	28"	34"	34"
Cross	10"	10"	10"	10"	12"	12"	12"
Vertical	16½"	16"	18½"	18"	14"	20"	19"
Sixteen Spindle Speeds	25-1500 rpm all sizes and styles (higher and lower ranges optional)						
Sixteen Feeds	¼-30" per min., all sizes and styles						
Motor Drive: Spindle	3 hp	3 hp	5 hp	5 hp	5 hp	7½ hp	7½ hp

CINCINNATI

It's a good idea to look "under the hood" when buying machine tools. Hidden features may give you some real clues to the machine's potential for your particular objectives. A quick look "under the hood" of CINCINNATI® ML and MI Milling Machines reveals a host of features that work unseen toward the common goal of every shop . . . to reduce the cost of production. Six features are illustrated below. Of course, there are many more, such as:

Automatic lubricating systems for column and knee reduce preventive maintenance

Knee and column oil filters may be removed from outside machine

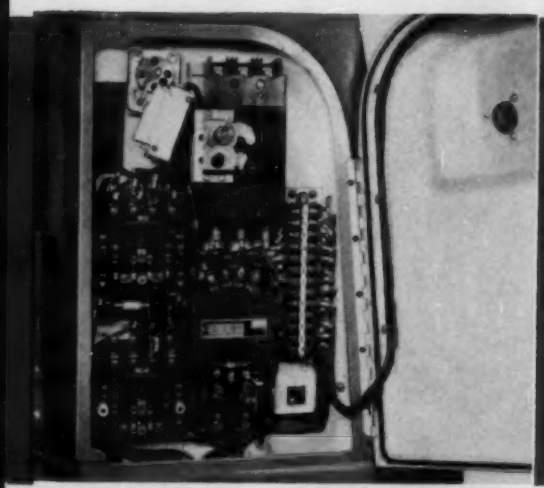
Hydraulic shifting of spindle drive gears gives the operator an assist

Live power rapid traverse at the rate of 150" per min. aids the setup man

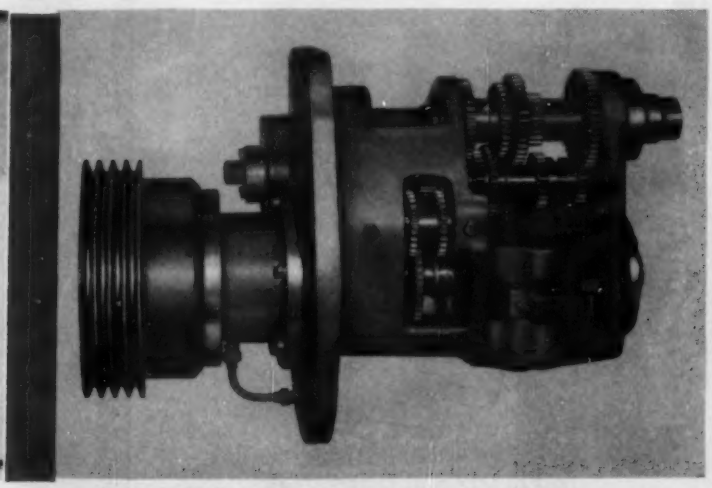
Big selection of standard attachments

CINCINNATI ML and MI Milling Machines are unquestionably a smart buy for your shop. Would you like to have more information about these machines? For brief data look in Sweet's Machine Tool File. Or for complete specifications, write for a copy of catalog No. M-1995.

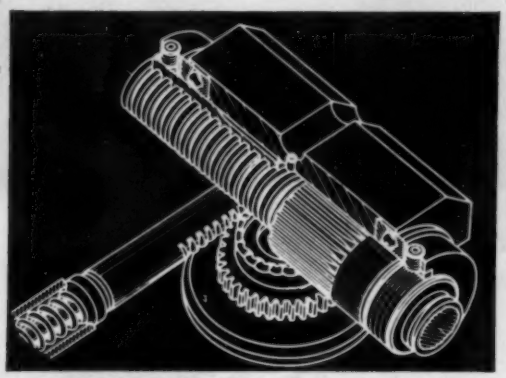
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



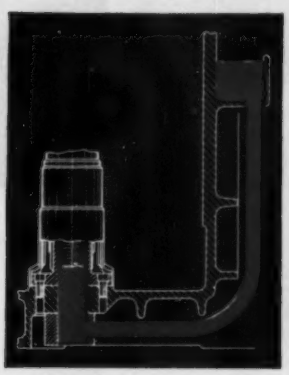
Electrical controls are built-in and completely enclosed for protection against accidental damage, dust and cutting fluid.



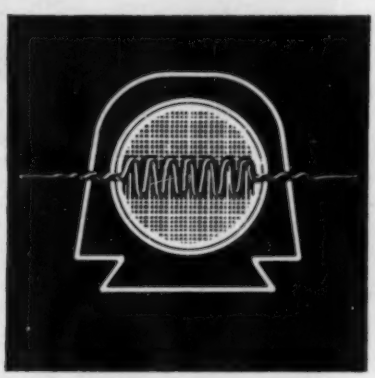
Unit construction saves maintenance dollars. The spindle drive assembly (above), feed box and gear shifter units may be removed easily and quickly from the machine.



Automatic backlash device increases productivity. Machine can mill equally well as the table feeds to the right, left or alternately right and left.



Vertical screw is submerged in a bath of oil from its own reservoir, assuring long, accurate life.



Dynapoise overarm smooths out the cutting action; provides straight-edge alignment for arbor supports.

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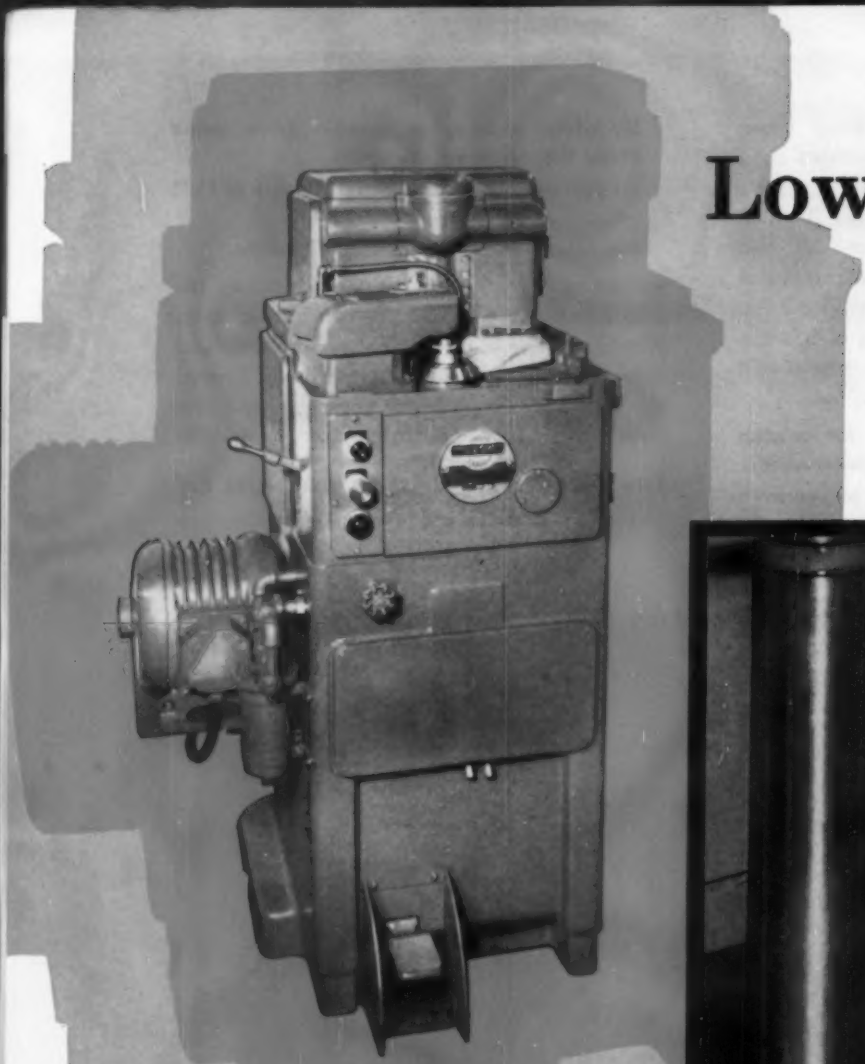
Lowers Pinion

WITH FELLOWS



FELLOWS 3" FINE-PITCH
GEAR SHAPER

Speed and accuracy of the new 3" machine increased production of this pinion from 55 per hour to 120.

THE
PRECISION
LINE

Production Cost from 16.9¢ to 6¢ each!

FINE-PITCH PRODUCTION EQUIPMENT

Fellows No. 4 Fine-Pitch Red Liner Inspection Instrument gives proof of accuracy.

Here's an example that shows how Fellows machines pay off in lowered gear production costs. This small pinion is manufactured for a major instrument maker on a Fellows 3″ Fine-Pitch Gear Shaper.

Production is 120 pinions per hour, more than twice the production of previous machines. In addition, pieces are automatically deburred, eliminating an operation. *Result:* the cost per pinion is 10.9 cents lower than before!

Fellows 3″ Fine-Pitch Gear Shaper cuts within close tolerances at speeds up to 2,000 strokes per minute. The Fellows No. 4 Fine-Pitch Red Liner inspection instrument gives chart-recorded, permanent proof of the accuracy of the product.

For full information about the Fellows Precision Line of gear production equipment—from 1/16″ P.D. to 120″ P.D.—contact your Fellows representative. Write, wire, or phone any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY,
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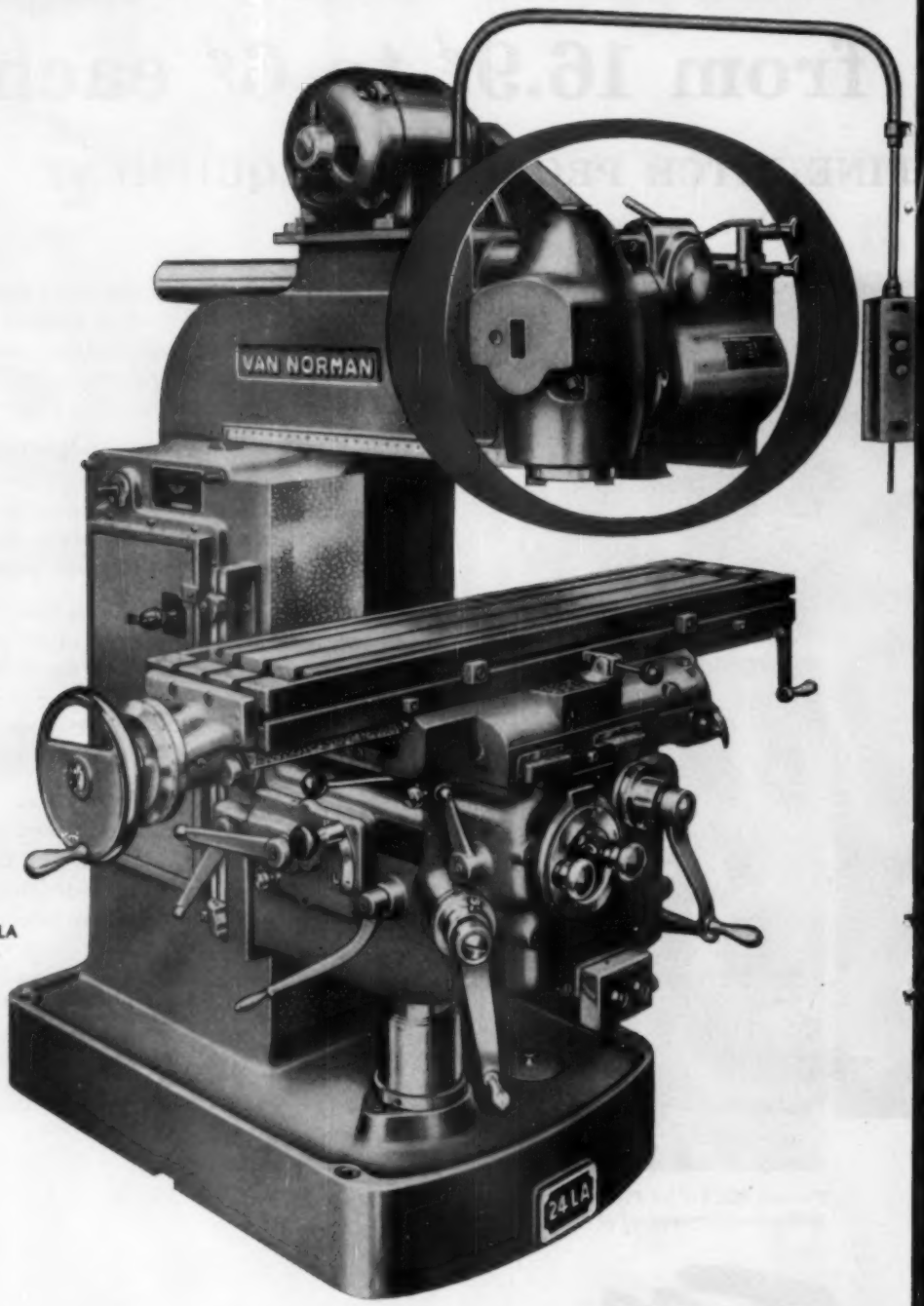
• Cut Costs • Save Man-Hours



The Van Norman 24LA
Horsepower — 3 HP
(spindle motor)
Table Size —
50" x 10½"

VAN NORMAN MACHINE

A DIVISION OF VAN NORMAN INDUSTRIES, INC.

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

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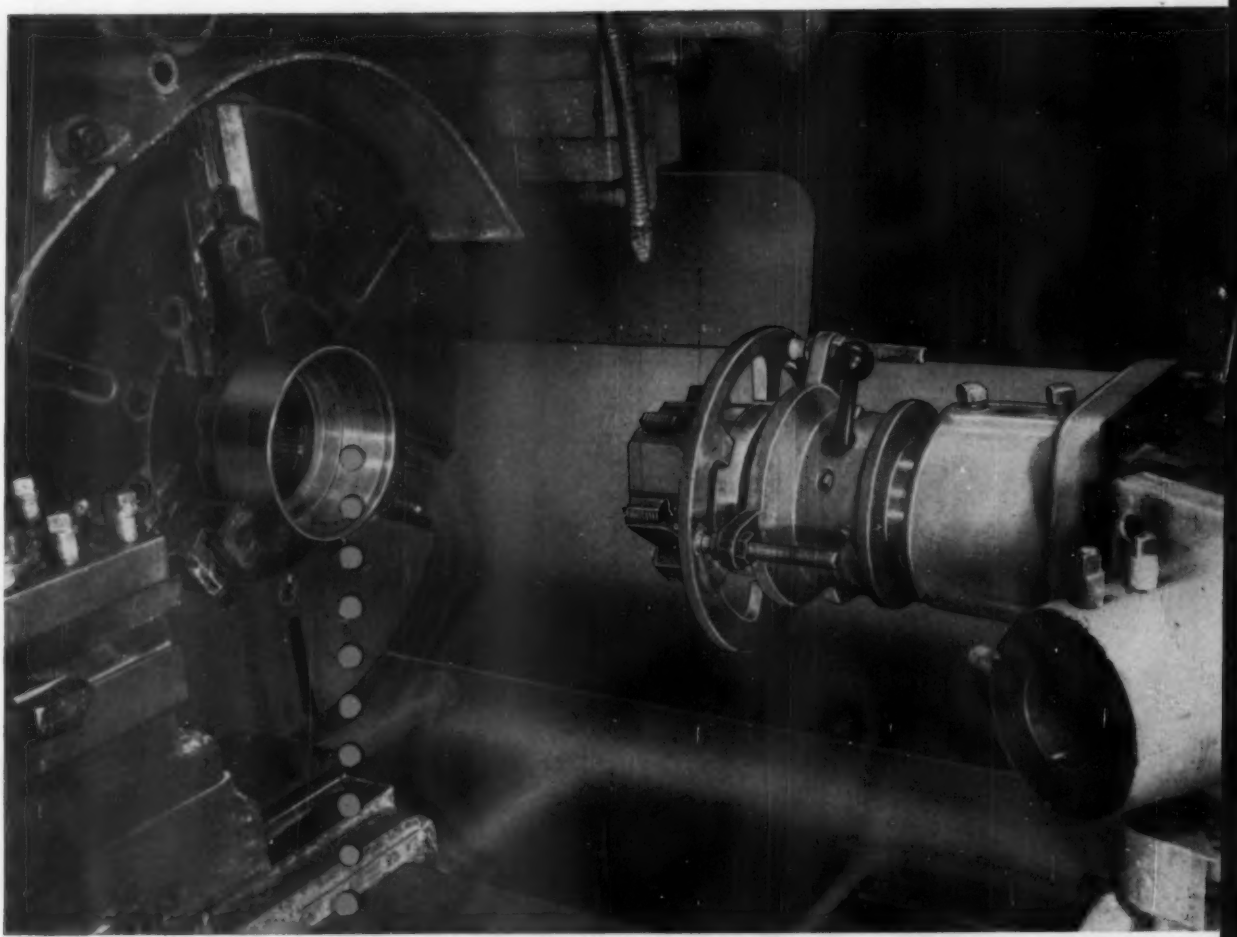
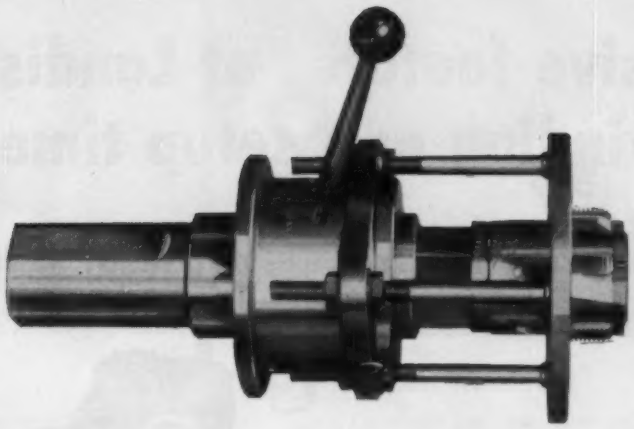


tapping 7-5/8" threads in tough steel



Rugged construction, allowing heavy metal removal in one pass, is one of the reasons a LANDIS Collapsible Tap is used to thread cylinder retainer caps for heavy duty hydraulic cylinders at the Cleveland Hydraulic Co., Bedford Heights, Ohio.

A LANDIS 6ALT Tap with a 7″ head is mounted on a turret lathe for threading 40-50 carbon cast steel normalized from 1600° to 1750°. 7⅝″ 8-pitch UN threads are tapped 2$\frac{3}{16}$″ long to Class 2 fit.

Another outstanding feature of the LANDIS ALT Collapsible Tap is the detachable head, permitting the use of tap heads of various sizes and capacities on the same tap body. For example, on the 6ALT illustrated, five heads will allow a threading range 6½″ to 13¼″. In addition, each tap head has a relatively wide threading range — the 7″ head shown here threads all diameters from 6½″ to 8″. Thus, as a result of the minimum equipment required for such wide range coverage, low initial cost and continuing economy of tooling are assured.

LANDIS ALT Taps may also be used to produce taper threads, with chasers cutting across their entire width if required. For more complete information on the various sizes of ALT Taps for threading all diameters from 1¼″ to 13¼″, write for Bulletin G-94.

499C

the world's largest manufacturer of threading equipment

LANDIS *Machine* COMPANY

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CUTTING · GRINDING
ROLLING · TAPPING

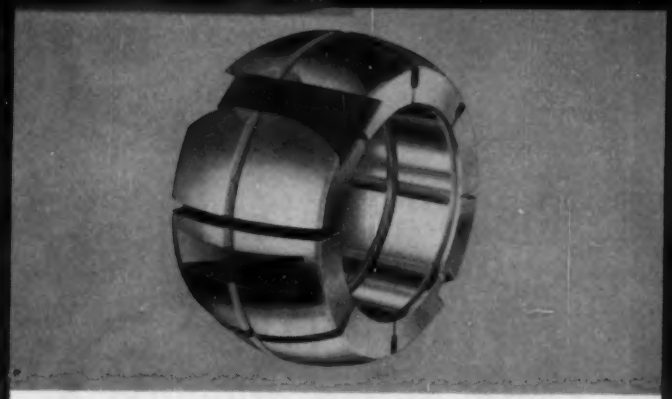
Exclusive features of Landis universals cut grinding and setup time for short runs

. . . fully universal grinder saves time on precision grinding operations
. . . speeds setup changes

Landis 12" x 36" Type CH Precision Universal Grinder

LANDIS
precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA



1 Landis Microsphere Bearings

Closest running clearance of any type spindle bearing gives finest finishes.

2 Eye-Level Wheel Feed

Operator can see both grinding operation and handwheel graduations.

3 Variable Speed Headstock

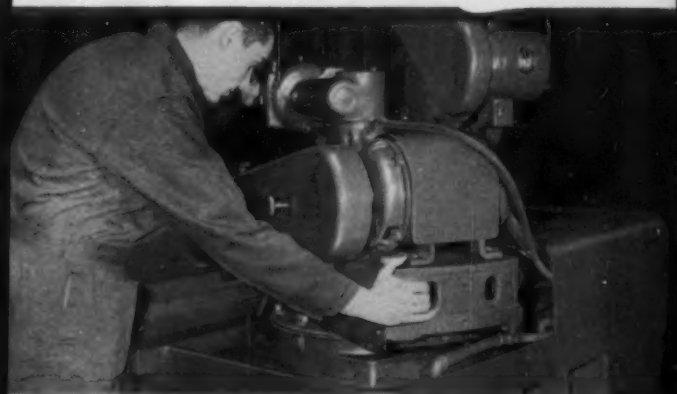
Low, compact headstock. Only two revolving parts. Speed regulated by a rheostat control.

4 Swinging Type Internal Grinding Fixture

Quick changeover, accurate and rigid. No exposed belts. Swings up out of the way.

5 Rapid Hydraulic Wheel Positioning

Saves setup time by rapidly advancing or retracting wheelhead. (Extra equipment.)



6 Universal Wheelhead Swivel

Easy hand swiveling of wheelhead—without bars—saves time when setups are frequent.

GIDDINGS & LEWIS
(MODEL 560-P)
PLANER TYPE
horizontal boring, drilling and milling machines

More production at lower cost is the best reason why you'll find G&L Planer Type horizontals on the job — day-in and day-out. They're available in various sizes and a wide range of feeds and speeds . . . spindle sizes 5" thru 14" dia. . . . motor drives 40 to 150 hp . . . and furnished with accordion-type way guards. The larger machines can be supplied with electric tracer control and heavy-duty spindle underarm support.

For more information on Planer-Type horizontals, see your nearest G&L representative, or write direct.

LITERATURE AVAILABLE:
For complete specifications on 50 Series Planer Type horizontal boring, drilling and milling machines, write for Bulletin No. 50-P.

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AUTOMATIC CYCLE

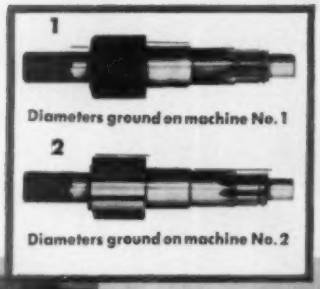


Photo of part showing diameters ground on two CINCINNATI FILMATIC No. 3 Centerless Grinders, one of which is illustrated below.

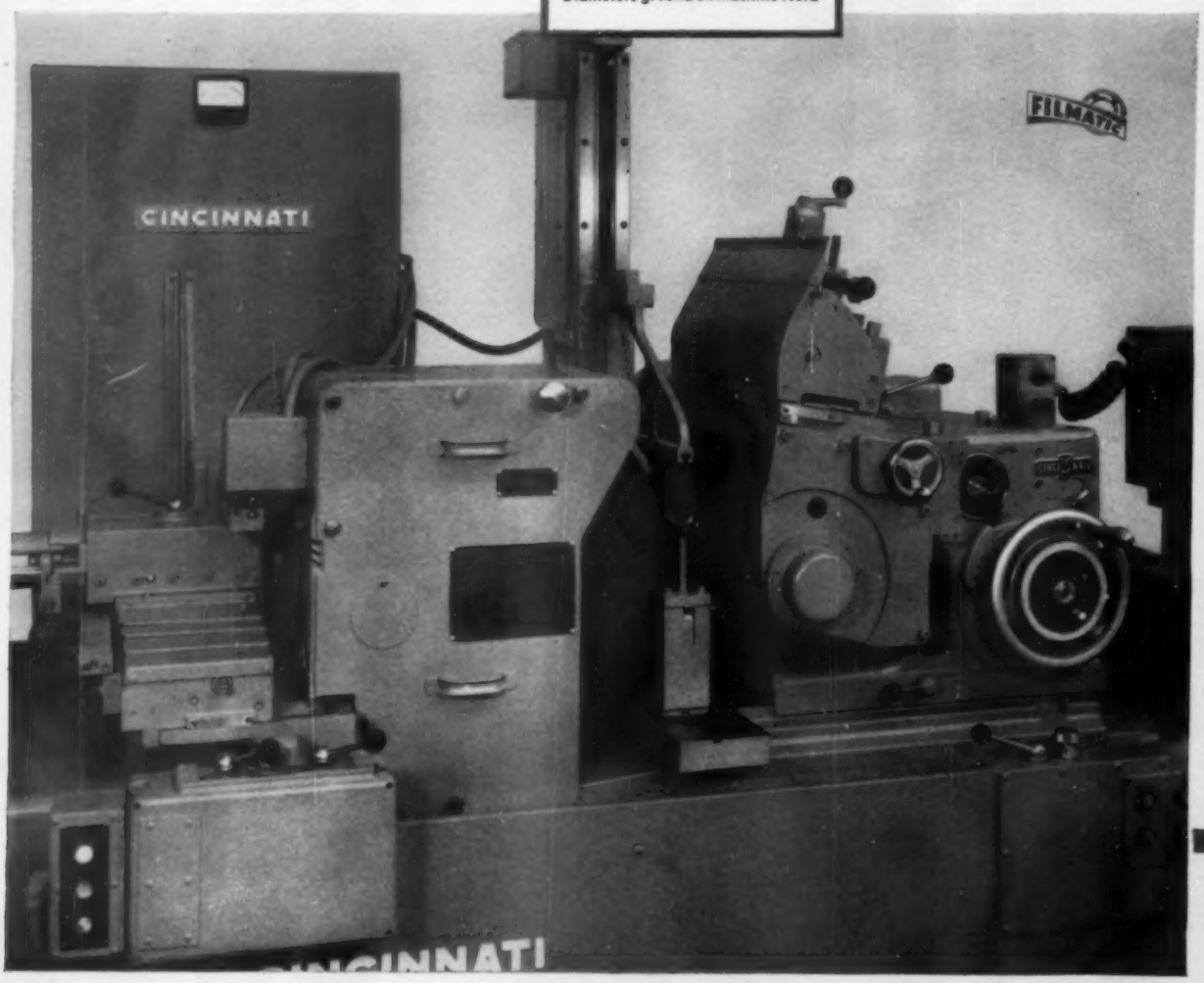
Part name .. Main shaft

Material ... Steel forging

Operation . Grind diameters in two operations, two machines

Production . Estimated 125 per hour, per operation per machine

Machines .. Two CINCINNATI FILMATIC No. 3 Centerless Grinders



CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE

on Cincinnati Filmatic No. 3 Centerless

INCORPORATES AUTOMATIC GAP ELIMINATOR

to compensate for variable grinding stock

Ordinarily, parts with the greatest amount of grinding stock govern production; they act as a penalty for the entire lot. Not so for the CINCINNATI® FILMATIC No. 3 Centerless Grinder illustrated here. Automatic Gap Eliminator, an exclusive Cincinnati feature, gives you the advantage of a shorter cycle time for all work pieces with less than the maximum stock. Other cost-reducing equipment includes:

Electro-Hydraulic Automatic Infeed Attachment
Hydraulic Automatic Lift Fixture
Automatic Grinding Wheel Balancing
Profile Truing for grinding wheel
Profile Truing for regulating wheel

The machine illustrated is one of two, both with identical equipment for grinding several diameters on main shafts. One machine grinds the diameters indicated on shaft 1, shown on the opposite page, and the second machine grinds the diameters indicated on shaft 2. For both operations, the work blade and regulating wheel contact the same bearing diameters, assuring a high degree of concentricity for all diameters. ¶ CINCINNATI FILMATIC grinding wheel spindle bearings, bedrock mounting of grinding wheel spindle, and double slide support for the regulating wheel unit are basic, time-proved features which you need to attain the lowest cost in precision centerless grinding. And Cincinnati's long established Engineering Service will tool up the machine to any degree of automation desired. It will pay you to bring your centerless grinding problems to Cincinnati.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

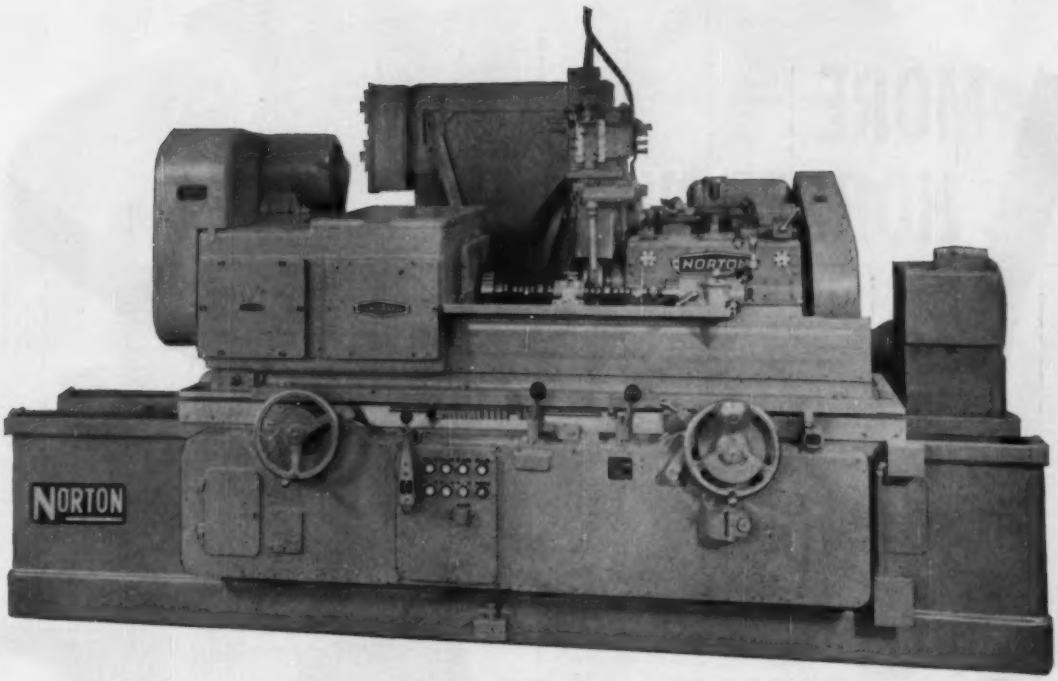
CINCINNATI FILMATIC No. 3 Centerless Grinder. Ask for catalog No. G-664-2. Brief specs on the entire Cincinnati centerless line in Sweet's Machine Tool File.

GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Norton's Newest!

The No. 3 CAM-O-MATIC grinds camshafts better...

BUILT-IN OPERATING SKILL of the No. 3 CAM-O-MATIC Grinder is a typical Norton "Touch of Gold" that adds value and boosts profits. Many automatic features on this greatly improved machine reduce the operator's duties to loading and unloading. He can easily tend two or more machines — while *you* get better grinding for less money.



Highly advanced automatic grinder sets new standards for production, precision and finish

With the No. 3 CAM-O-MATIC Grinder, Norton introduces a new concept of efficiency in camshaft grinding.

No other machine of its type offers you such a combination of exclusive features, rugged construction and simplified operation. No other machine can do more towards stepping up the quality of your camshaft production, while cutting grinding time and costs.

Greater Rigidity Improves Performance

The No. 3 CAM-O-MATIC Grinder features solid, rigid construction that means minimum vibration, more accurate performance and longer service life. Another big advantage for fluid, shockless operation is that the entire operating cycle is geared to split-second efficiency. Indexing is ultra-smooth and extra-rapid. And the wheel-slide retraction after grinding each cam is no greater than maximum stock removal.

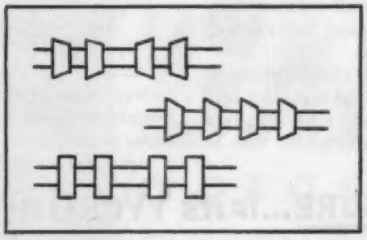
Speed is always right — automatically

The No. 3 CAM-O-MATIC Grinder's automatically compensating work speed arrangement is a valuable aid to faster, more accurate grinding. Starting with the ideal speed for rapid stock removal, it changes to exactly the right speed for fine finishing and contour accuracy — as each cam is being ground. This eliminates guesswork, manual adjustment and lost motion.

Wheel truing is automatic, too

Still another example of built-in operating skill is the wheel truing device, in which the truing diamond is automatically advanced across the wheel face and back, cutting in both directions. This is done while the operator is loading and unloading, so no time is lost. And by removing only just the amount of abrasive required for truing, the working life of every wheel is prolonged.

Your choice of tapers



The swiveling wheel slide — a Norton patent — permits grinding cam tapers in one direction (standard equipment) or tapers in opposite directions on the same shaft (an optional extra). Both arrangements permit straight-face grinding, as well — thus increasing the versatility of your camshaft production equipment.

See your Norton Representative — or write direct — for full details on the No. 3 CAM-O-MATIC Grinder. And remember, only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

***To Economize, Modernize with* NEW**

NORTON

GRINDERS *and* LAPPERS

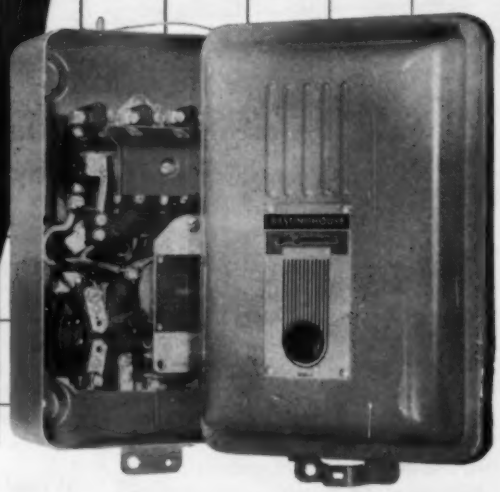
Making better products... to make your products better

District Sales Offices:
Worcester • Hartford • New York Area, Teterboro, New Jersey • Cleveland • Chicago • Detroit — In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5, Ontario

MORE HORSEPOWER!

LESS COST!

SMALLER SPACE!



with Westinghouse rerated motor starters

Here's real news for cost-conscious, space-conscious electrical planners.

Westinghouse Life-Linestarters® (sizes 0 and 1) *have been uprated* . . . giving you the advantages of more horsepower, less space, lower cost!

For example: if you've been controlling a 440-volt, 5-hp polyphase motor with a size 1 starter, you can get the identical control and protection with the smaller, less costly size 0 starter.

And speaking of performance . . .

Only Westinghouse starters have the De-ion® arc quencher, which greatly increases contact life by reducing burning and pitting.

Westinghouse starters utilize high-strength, non-carbonizing Rosite insulating parts for maximum safety and operating life.

Westinghouse starters have double-break, silver-to-silver contacts for longer life and greater dependability.

What's more, the entire starter line is designed to simplify installation and maintenance — featuring front-removable parts and straight-through wiring.

For the full story, contact your nearby Westinghouse sales office. Or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Penna. J-30280

NEMA SIZE	110 Volt				220 Volt				440-600 Volt			
	1ø		3ø		1ø		3ø		1ø		3ø	
	Old Rating	New Rating	Old Rating	New Rating	Old Rating	New Rating	Old Rating	New Rating	Old Rating	New Rating	Old Rating	New Rating
0	1	1	1½	2	1½	2	2	3	1½	3	3	5
1	1½	2	3	3	3	3	5	7½	5	5	7½	10

Westinghouse uprated starters give you: More horsepower — in eight new starter ratings. Less cost and space — in applications where the rerated size 0 starter replaces the size 1 starter, and the size 1 replaces the size 2.

YOU CAN BE SURE... IF IT'S Westinghouse

Gardner cylinder-type abrasive cuts 30% from grinding time

...change to Gardner 20" diameter disc from 18" segments steps up production on hardened steel washers

production data

Part	Hardened steel washers
Fixturing	Magnetic chuck
Stock Removal	.006" per side
Flatness	.001"
Parallelism	.001"
Uniformity	.002"
Production	185 parts per chuck load in 2 minutes

GARDNER

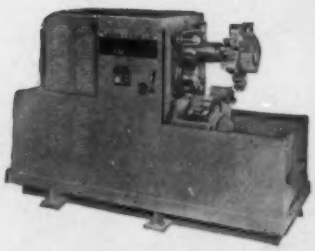
abrasive discs

BELOIT, WISCONSIN

WARNER & SWASEY 2 AC AUTOMATICS

pay for themselves with one year's savings at Thew Shovel Company

Cost savings from 47% to 77%! That's the production record of two Warner & Swasey 2 AC Automatics on small and medium lot work at Thew Shovel Company, Lorain, Ohio. Annual dollar savings exceed the cost of both machines plus tooling! On small and medium lot work these automatics can undoubtedly return substantial savings for you. To discuss their application to your work, call in our Field Engineer.



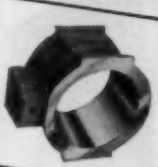
1 AC CHUCKING MACHINE
8" or 10" Chuck—6" Working Stroke

2 AC CHUCKING MACHINE
10" or 12" Chuck—9" Working Stroke

3 AC CHUCKING MACHINE
15" Chuck—11" Working Stroke

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS ... WITH A WARNER & SWASEY

PRODUCTION RECORD

PART	PART NAME	OLD TIME	NEW TIME	MONTHLY TURNOVER	% SAVINGS
	Pinion	.280 hours	.087 hours	100	69.0%
	Roller	.392 hours	.087 hours	2000	77.8%
	Sprocket	.376 hours	.177 hours	175	52.4%
	Roller	.373 hours	.126 hours	447	66.2%
	Roller	.372 hours	.141 hours	109	62.2%
	Spacer	.074 hours	.039 hours	770	47.2%
	Box	.431 hours	.193 hours	108	55.6%
	Box	.504 hours	.231 hours	36	54.0%

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

Your friend
indeed
when you're
in need...

the man behind the man behind

... the MORSE

Morse Designers...

Morse Engineers...

Morse Modernized Plant...

Morse Master-Craftsmen...

all backing up

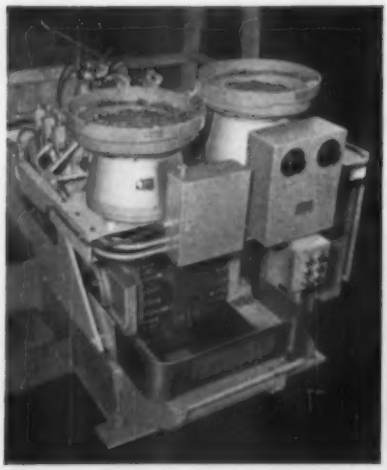
* **THE MORSE-FRANCHISED DISTRIBUTOR**

MORSE TWIST DRILL & MACHINE COMPANY

New Bedford, Mass.

A Division of VAN NORMAN INDUSTRIES, INC.
Warehouses in
New York, Chicago, Detroit, Dallas, San Francisco

the MFD*
MASTER-CRAFTSMAN



They needed
high production . . .
and they're getting it

on this LAPOINTE CONTINUOUS

BROACHING MACHINE

WITH ELECTRO-MECHANICAL DRIVE

48 parts per minute, 2880 parts per hour — that's the broaching rate on the full radius of the electrical hanger stud shown here. Taking the malleable iron casting, as cast, and removing 1/16" stock to a fine finish by Lapointe-Broaching, production is faster than would be possible by any other method.

Cost-per-part is at the minimum when broaching on the amazingly efficient Lapointe Continuous-Broaching Machine equipped with hopper feed, automatic loading fixture, and chip conveyor. You push the starter button and your worries are over — *costs are down, quality is up!*

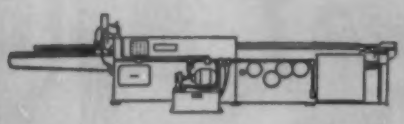
If you are machining repetitive parts it will certainly pay you to talk with a Lapointe Field Engineer. He probably can show you how to *convert to Lapointe-Broaching* and cut production costs. Remember: Lapointe can assume all the responsibility for any broaching program . . . we design and build the broaching machines, the broaching fixtures, and the broaches.

THE LAPOINTE MACHINE TOOL COMPANY

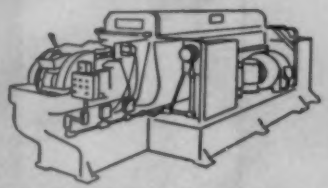
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

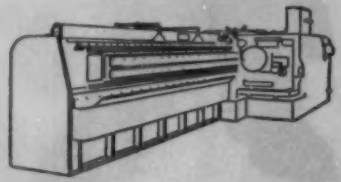
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



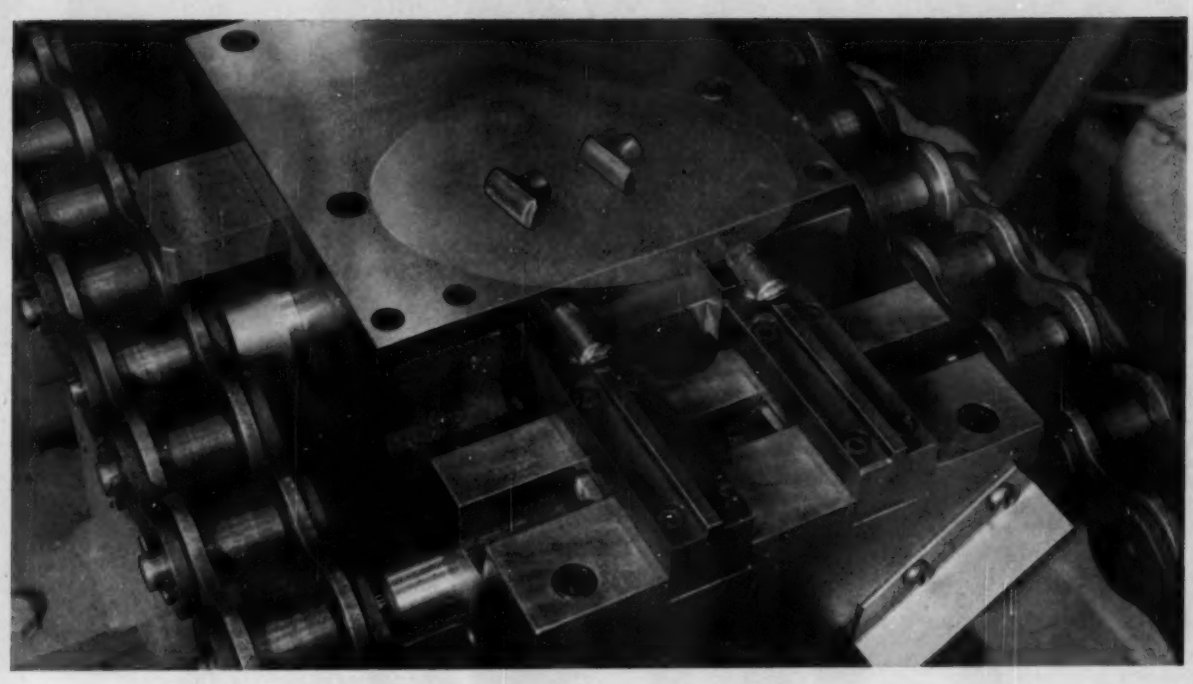
60" STROKE HORIZONTAL, ELECTRIC



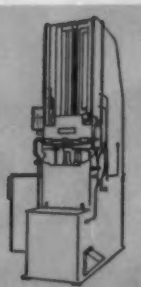
CH CONTINUOUS BROACHING, ELECTRIC



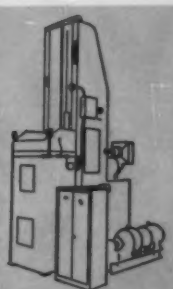
SRHE SINGLE RAM HORIZONTAL, ELECTRIC



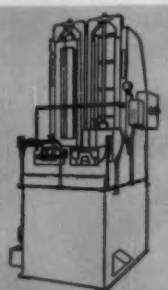
10-Ton, 42-inch Stroke Lapointe Continuous Broaching Machine with Electro-Mechanical Drive. It broaches the electrical hanger stud at 35 feet-per-minute, using 15 fixtures on the heavy-duty chains — each fixture holding two parts for broaching.



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING

1300 ft. Transfer-matic Performs 2291 Operations on V-8 Blocks

Blocks enter with ends exposed. After tapping ends and top, they are rotated to car position for tapping banks and sides. Final position is bottom up for tapping pan rail and under banks.

Valve lifter holes are drilled, rough reamed, finish reamed and inspected.

With blocks in car position, mounting pads are milled, cylinder head bank faces are drilled, chamfered and counterbored and deep oil holes are drilled.

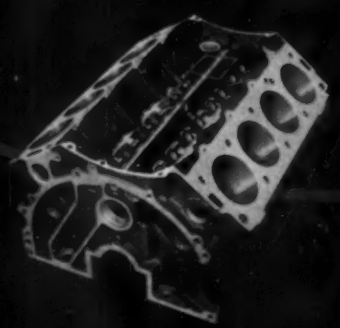
Blocks are turned on sides. Then distributer hole is rough and semi-finish bored, all holes in top are drilled and chamfered and crankshaft bearing cap holes and oil holes are drilled in bottom.

Blocks are turned 90 degrees, all holes in ends are drilled and chamfered, three oil gallery holes are pressure tested and cam shaft bearing diameters are rough bored. Then blocks are turned to car position.

Blocks enter bottom up. Oil pan screw holes are drilled, transfer spots are machined in pan rail, under banks are drilled and chamfered and blocks are turned to car position.

Here is the answer to the automobile industry's insistent request for machine tools which will reduce the cost of model changes and shorten change-over periods. This giant "Sectionized" Transfer-matic is constructed with an entirely new set of Cross building blocks and applies new concepts of standardization to machine bases, transfers, fixtures and heads.

- ★ Capacity to machine any passenger car engine block.
- ★ 270 stations in 17 sections, each with independent controls; sections operate automatically as blocks are made available; any section may be stopped without interrupting production of others.
- ★ 2291 operations on 185 blocks simultaneously.
- ★ Rated capacity of 350 cylinder blocks per hour.
- ★ Cross Machine Control Units with Toolometers for efficient tool programming.
- ★ Pre-set tools to reduce downtime.



Another Automation First by Cross

Photo shows
Sections II, III, IV
and V of Line A.

Established 1898

THE CROSS CO.

First in Automation

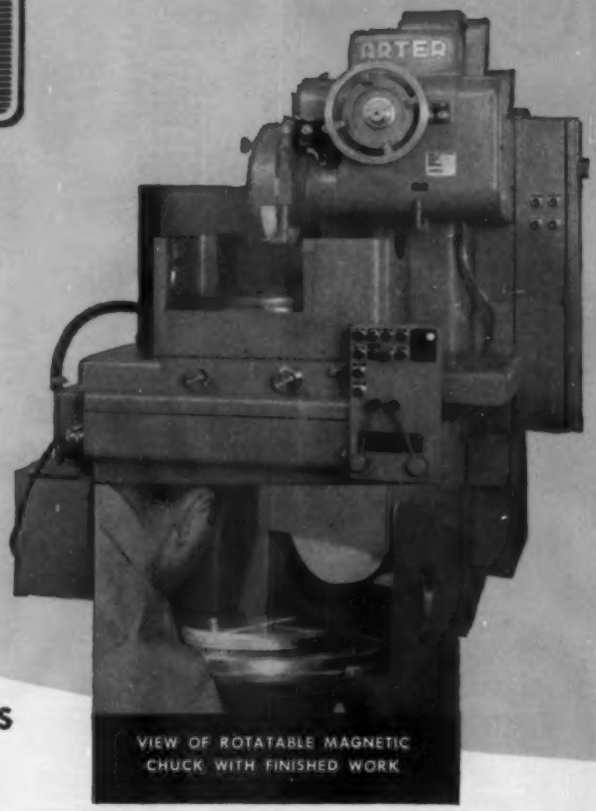
PARK GROVE STATION • DETROIT 5, MICHIGAN

For Better Surface Finishes . . .
It's Smarter to use . . .

ARTER

PRECISION GRINDING MACHINES

MODEL E HYDRAULIC
ROTARY SURFACE GRINDER



VIEW OF ROTATABLE MAGNETIC CHUCK WITH FINISHED WORK

PRODUCTION GRINDING THAT ALWAYS RESULTS IN MICRO-PLANE FINISHES

The complete line of Arter Precision Grinding Machines is designed and engineered to provide remarkably accurate, micro-plane surface finishes. These uniformly consistent finishes result in a minimum of grinding operations . . . avoiding time-consuming extra finishing that makes production costs soar.

The superiority of Arter micro-plane finishes is a result of the grinding method. All grinding is done on the peripheral or outer edge of the wheel while the work is held on a rotating electro-magnetic chuck. The grinding wheel touches the work at only one spot resulting in an extremely fine, concentric finish. It's just the right touch for surfaces so uniform that, in many cases, they seal without lapping.

Accuracy and versatility are an inherent part of all Arter Machine Grinders. Each machine features rigid, vibration-free construction . . . hydraulic controls . . . variable stepless speeds for both chuck and wheel slide traverse . . . manual and automatic feeds . . . adjustable work tables for concave or convex grinding . . . convenient push-button control panel and compact design.

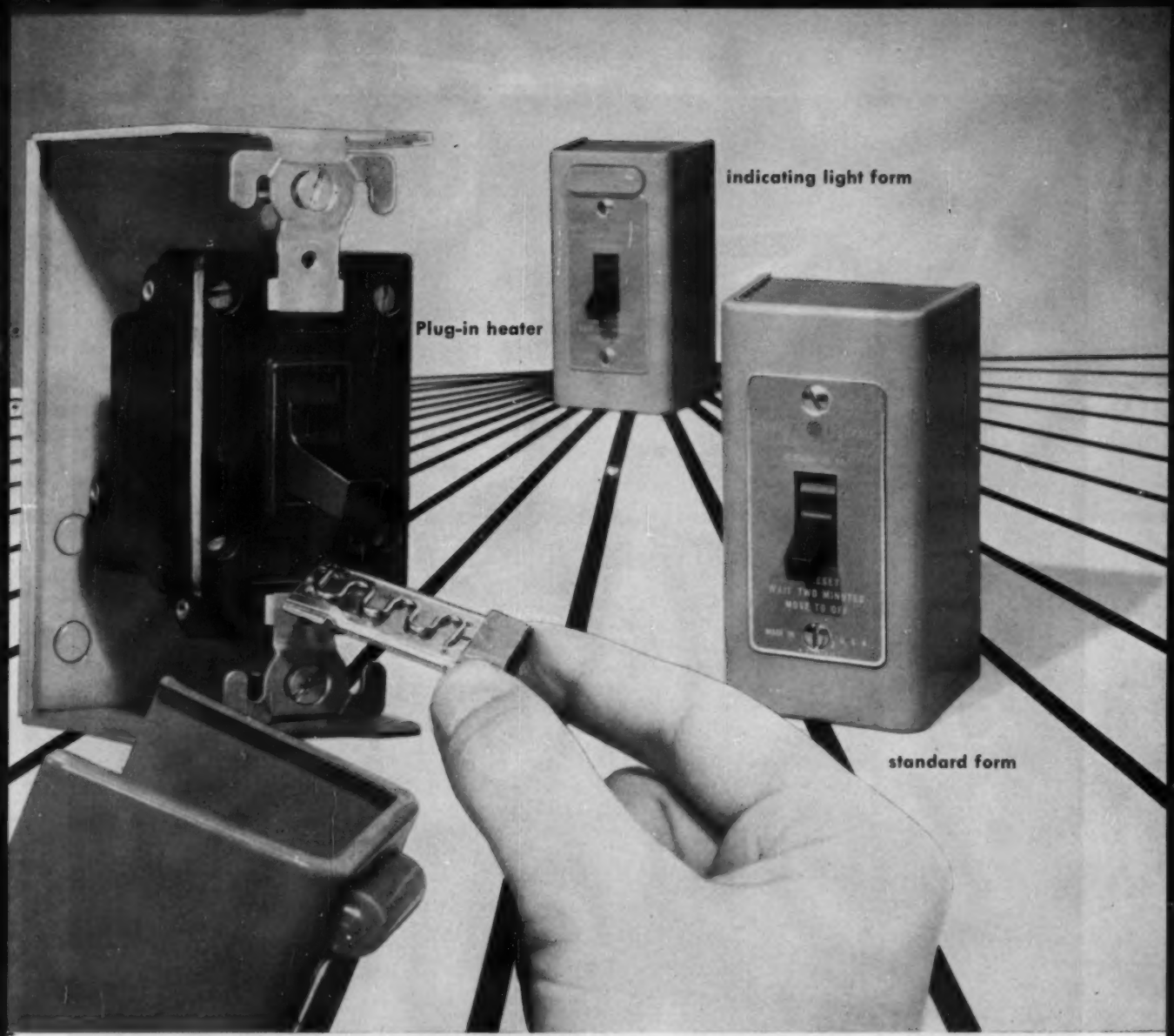
Arter Grinders are available in chuck sizes ranging from 8" to 40". Whatever your grinding requirements, you'll find it smarter to use Arter.

FOR DETAILED INFORMATION
on any machine, call your Arter representative or write for free brochures.

ARTER GRINDING MACHINE COMPANY

Manufacturers of Rotary Surface, Internal, External Grinders and Jigmatic Positioning Tables.

15 SAGAMORE ROAD, WORCESTER 5, MASSACHUSETTS



PLUG-IN HEATER, SMALLER SIZE WITH . . .

New General Electric Manual Starter

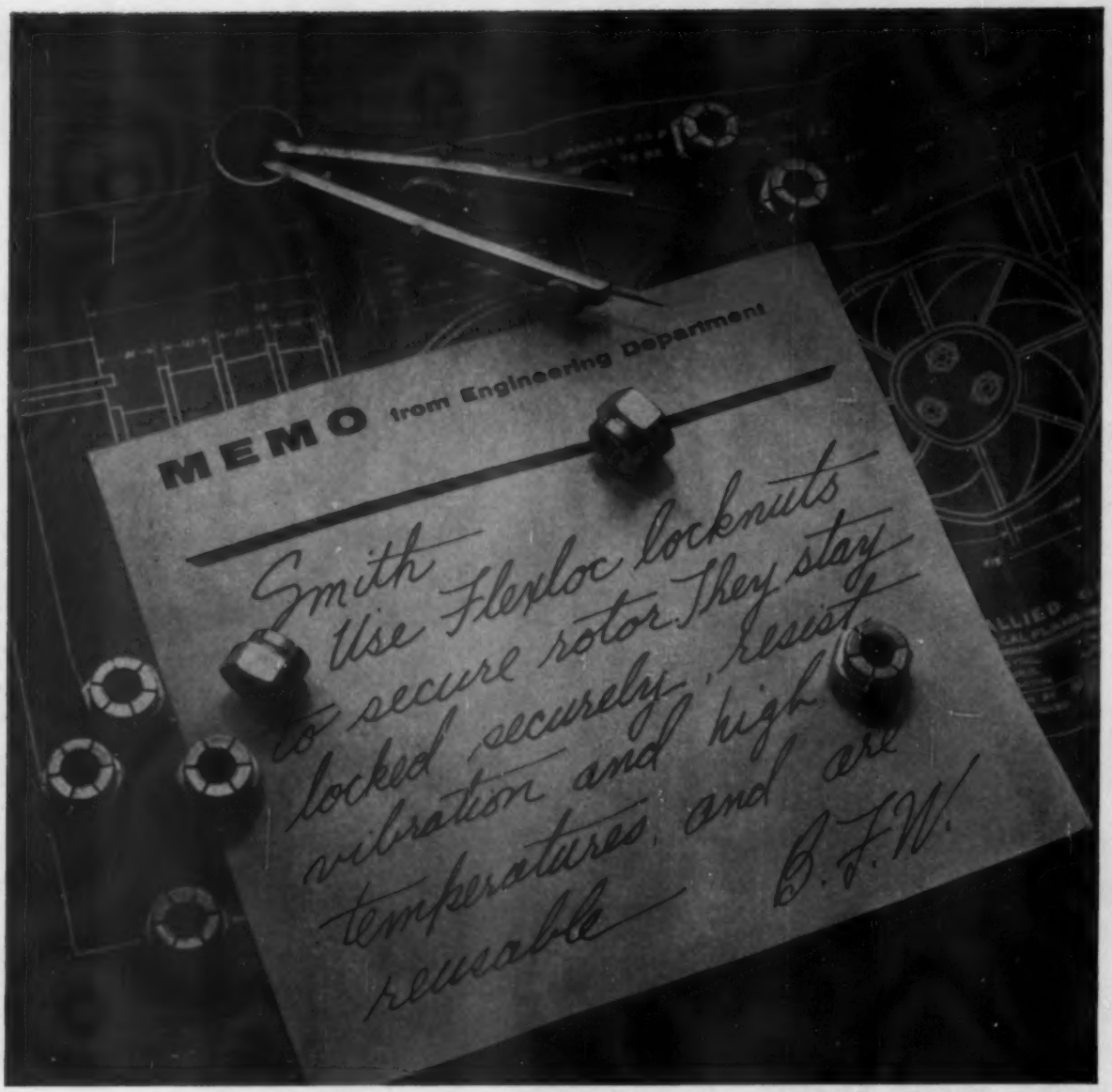
You can install or change the heater in the new General Electric manual starter in a matter of seconds. Simply remove the wrap-around cover, and insert the heater. The heater plugs in from the front of the starter and is keyed so it can't possibly be inserted the wrong way.

NEW SMALLER General Electric manual starter, shown actual size above with cover removed, can be installed in gem or handy boxes. The new neon indicating light form is same size as standard form.

OTHER FEATURES include positive indication of overload. Under overload conditions, the handle moves to mid-position. Fast acting mechanism and dependable fine silver contacts provide long contact life. A new wrap-around cover lifts off to give greater accessibility. Terminal design eliminates wire looping, cuts wiring time.

FOR COMPLETE INFORMATION contact your nearest General Electric apparatus distributor or write advertising section 733-34 for bulletin GEA-6358. General Electric Co., Bloomington, Illinois.

GENERAL ELECTRIC



Vibration won't loosen FLEXLOC self-locking nuts

Where products must be reliable . . . must stand up under vibration, temperature extremes and hard use . . . designers specify rugged, reliable, precision-built FLEXLOC self-locking nuts.

HERE'S WHY:

FLEXLOC locknuts are strong: tensile strengths far exceed accepted standards. They are uniform: carefully manufactured to assure accurate, lasting locking action. And they are reusable: repeated removal and replacement, frequent adjustments, even rough screw threads will not affect their locking life.

Standard FLEXLOC self-locking locknuts are available in a wide range of standard sizes, types and materials to meet the most critical locknut requirements. Your local industrial distributor stocks them. Write us for complete catalog and technical data. Flexloc Locknut Division, STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

We also manufacture precision titanium fasteners. Write for free booklet.

STANDARD PRESSED STEEL CO.

FLEXLOC® LOCKNUT DIVISION

SPS

JENKINTOWN PENNSYLVANIA

Production Pointers from GISHOLT

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

NEW SIZING CONTROL AT SUPERIOR STEEL PRODUCTS CORP. CUTS COSTS

Production setup Superfinishes die-set guide pins to ± .0001"

Here's how Superior Steel Products Corporation, Milwaukee, Wisconsin, uses Superfinish to maintain ideal clearances on die-set guide pins from 6" to 18" long and ¾" to 2½" in diameter. For close-tolerance finishing of cylindrical surfaces, you'll want a closer look at this new automatic size control unit for Gisholt 51A and 52A General-Purpose Superfinishers.

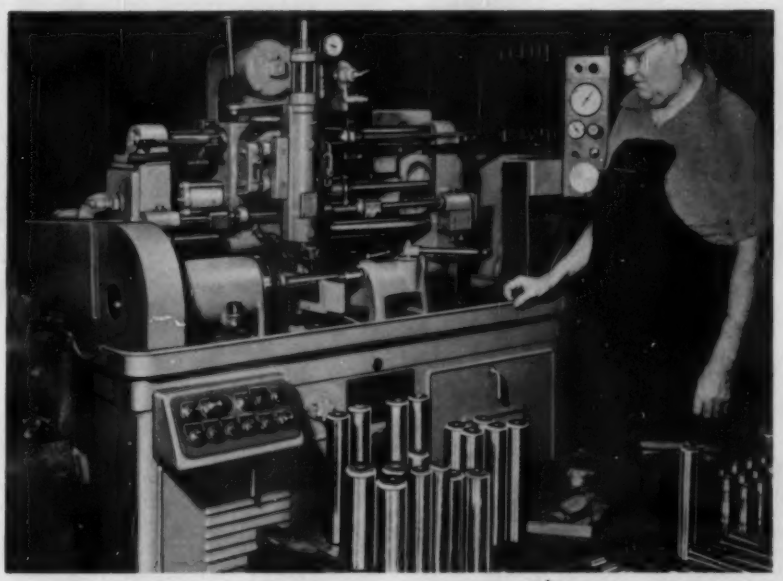
Mounted on a standard Gisholt 51A General-Purpose Superfinisher, this new unit has a U-shaped head with two adjustable jet cartridges, set .0015" from the work, which rotates between without making contact.

Operation is fast and simple. The operator places the work between centers and starts the Superfinishing cycle. As the Superfinishing stone quill descends, the size control head is raised under the part to operating position. Ordinarily, the Superfinisher has a rough and finish cycle preset by electric timers. The size control head replaces the roughing timer so that the length of the roughing cycle is automatically determined by the amount of stock to be removed.

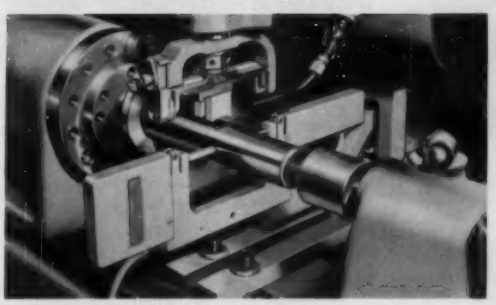
When the desired dimension is reached, the size control initiates an electrical connection, increasing the spindle speed and starting the finishing cycle which is controlled by the standard timer. Enough stock is removed during the roughing cycle to bring the part within the required tolerance; and the standard finishing cycle is still used to give the desired low micro-inch surface finish. As the Superfinishing cycle ends, the stone quill retracts and the size control head descends, thus clearing the part for unloading.

In the setup shown, Superior Steel is Superfinishing a guide pin 8" long and 1½" in diameter in 50 seconds f.t.f. time. The hardened parts come to the machine from .0002" to .0012" above the mean dimension, and are Superfinished to a controlled surface finish of 2 to 3 micro-inches and sized within .0002" of each other. 300 to 350 pins are Superfinished before the stone must be replaced.

Superfinish reduces possibility of scoring, offers smoother operation. Many hours can be saved by Superfinishing parts within .0002" of each other on a production basis using low-cost, general-purpose Superfinishers equipped with size control units.



▲ 51A Superfinisher, with size control unit to Superfinish hardened die-set guide pins within 2 to 3 micro-inches RMS, and holding size within ± .0001" of each other. Several part sizes handled are shown in foreground.



◀ Size control head on 51A Superfinisher, set up for 8"-long, 1½"-diameter guide pin. Variety of parts is handled, with tooling changed several times daily. Change-over time is 5 min. or less.

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

HOW PRATT & WHITNEY USES JETracer ON TRICKY JET ENGINE PART

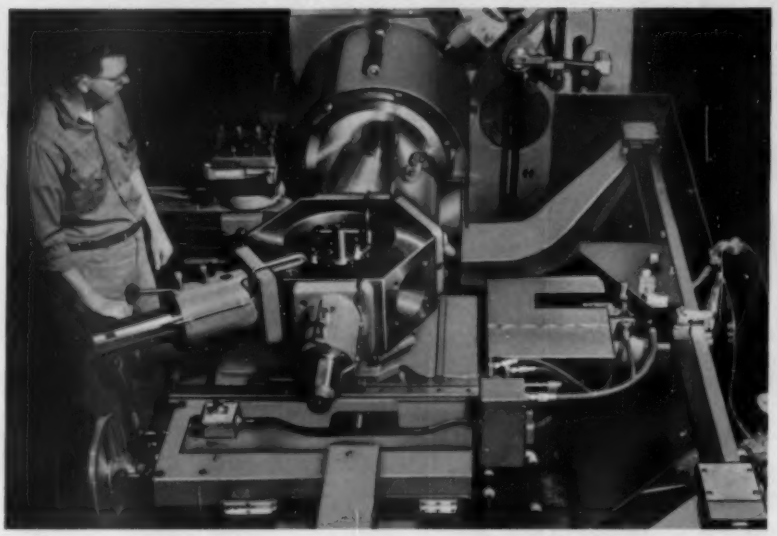
Machines bell-shaped end of special-alloy part with speed and precision

If you're producing parts requiring contour boring or turning operations, perhaps you can use this arrangement to reduce tooling costs and cut your set-up time.

Here's how Pratt & Whitney Aircraft's North Haven, Connecticut, plant is machining the bell end of a special-alloy rear compressor rotor for jet engines. A Gisholt MASTERLINE 4L Saddle Type Turret Lathe is used, equipped with a cross-feeding turret JETracer control with 8" of transverse travel. A bonnet-type fixture holds the long workpiece, providing ample rigidity. Setscrews grip on the large O.D., centralizing the work and dampening vibrations to provide a smoother finish.

The JETracer governs transverse movement of the cross-feeding turret as the stylus follows a flat template, which is mounted at the rear of the turret carriage.

Standard front square turret and hexagon turret tools finish a 19⅝" flange and rough-out a part of the small bore at the base of the cone. The 12"-deep cone angle is generated —and the small base bore contoured by a tool in a special offset flanged holder on the JETracer-controlled, cross-feeding hexagon turret. Concentricity between flange O.D. and the cone base diameter is held within .001". Floor-to-floor time on this difficult part is held to only 45 minutes.

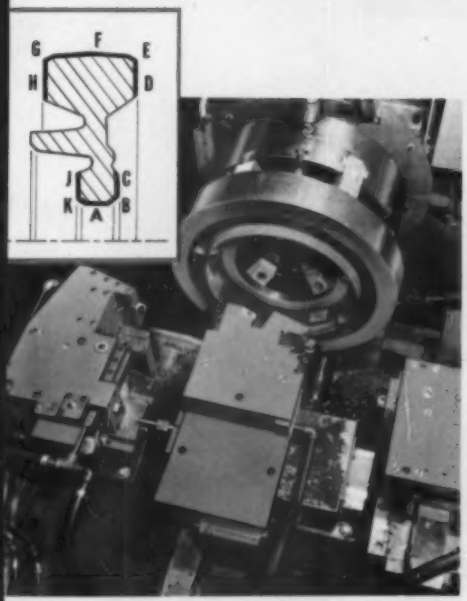


JETracer control for cross-feeding hexagon turret is at rear, away from chips. Template has dial indicator and locating blocks for transverse and longitudinal adjustment.

JETracer-controlled, cross-feeding hexagon turret gives added flexibility for fast, accurate internal boring operations. Handles long or short workpieces anywhere along length of bed. Depth limited only by length of boring bar and runout tolerance of part.

SETUP ELIMINATES OPERATION IN MACHINING 27" FLYWHEELS

Simplimatic setup completes maximum number of surfaces in single chucking, assuring parallelism and concentricity



This setup may be just what you want to cut unit costs. By taking advantage of the Simplimatic's versatility, this manufacturer is machining 27"-diameter cast iron flywheels in just 7.5 minutes f.t.f.

Here's how it's done: The operator positions the part with an overhead crane. Located on the web against jacks on the 24", three-jaw scroll chuck face, the flywheels are gripped through three cast openings using a power chuck wrench. The Simplimatic's platen table traverses tools to the work, changes to feed, and finishes bore A with three tools on the center slide. Spindle speed is 90 r.p.m.

When the bore is finished, a two-speed motor reduces spindle speed to 45 r.p.m. All slides operate simultaneously. Four tools on the front slide straddle-face D-H and chamfer E-G. The front facing tool block pivots for tool relief. Tools on a cam-controlled auxiliary slide on the rear slide contour-turn F, leaving the center .023" high with a ⅛" radius at the high point. The turning tool is relieved at the end of the cut. Center slide tools feed transversely, straddle-facing C-J and chamfering B-K to complete the part.

◀ Overhead view showing workpiece, method of chucking, surfaces machined and tooling. Note pivoting tool relief on front slide at left end, and cam-operated auxiliary slide in tool block at far right.

Simplimatic's flat platen table permits positioning independent slides for maximum tool support and effectiveness. Two-speed motor provides desired finish; table feed saves additional handling or special tooling for boring operation.

GISHOLT

TIME-SAVING IDEAS

NATIONAL CASH REGISTER CUTS TIME MACHINING UNUSUAL PART

Combines well-planned tooling with JETracer on Gisholt Ram Type Turret Lathe to reduce floor-to-floor-time

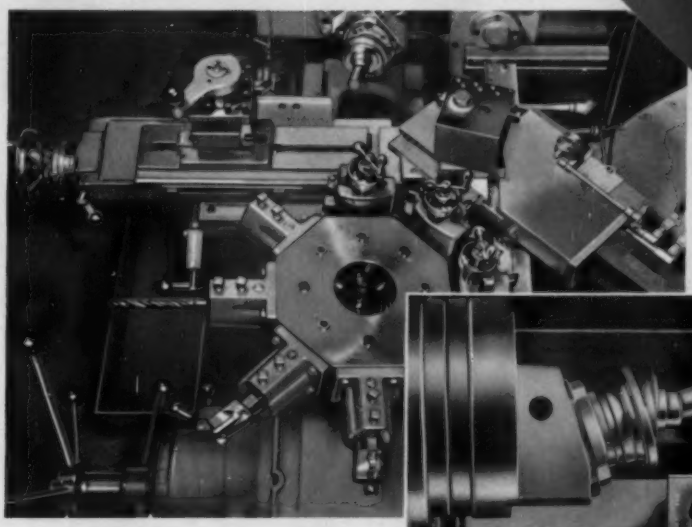
This setup shows how National Cash Register Company, Dayton, Ohio, is machining a steel motor wobbler drive shaft forging—using the versatile Gisholt JETracer on the MASTER-LINE No. 5 Ram Type Turret Lathe.

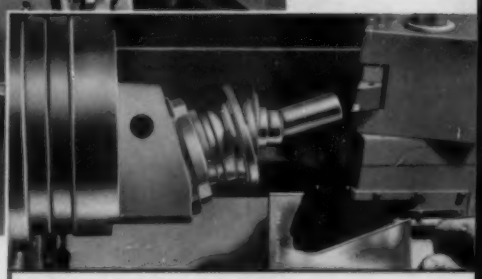
The part actually has two center lines. It is held parallel to the spindle center line during the first three operations, then held on an offset fixture to machine several eccentric diameters to high accuracy in the final operation.

The large flange is machined in the first operation. All internal diameters —plus five diameters in section A— are handled in the second operation.

For the third operation, the work is chucked on the large end, locating against the back of the large flange. The long shaft and the concentric diameters in section B are finished, using the JETracer and tools on the octagon and front square turrets.

To finish the eccentric diameters, a special expanding mandrel on an offset face plate fixture supports and locates the work in the previously machined I.D. Front tool post tools rough, and the JETracer on the rear of the cross slide finish contour-turns this section. Floor-to-floor-time is thus held to an impressive 2.85 minutes.





▲ Finished part shown on offset face plate fixture. Note octagon turret. JETracer on rear of cross slide does not hinder use of standard tools.

(Inset) Workpiece on special offset fixture with template in foreground.

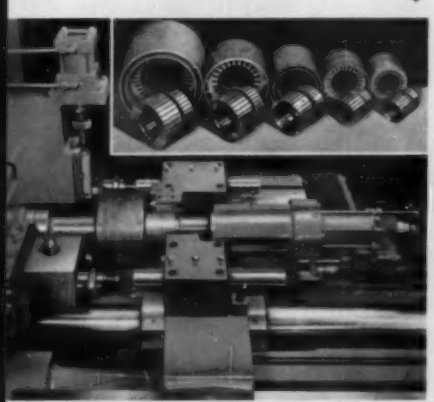
L. to R.: Workpiece after first operation, showing amount of stock to be removed; finished part, with both center lines indicated and eccentric surfaces outlined; sectioned workpiece showing internal surfaces.

JETracer saves time, assures accuracy, eliminates human error. Only one tool on octagon turret is replaced during the four operations. Square turret tools are changed as needed.

VALLEY ELECTRIC LOWERS COSTS IN MOTOR FRAME MANUFACTURING

Handles both ends in single chucking on No. 12 Automatic using special auxiliary slides

Bushings and spacers for expanding mandrels speed change-over. Spacers added when bore diameter remains the same, bushings added when bore diameter changes. ▼



You may see the way to more parts per hour by studying this setup at Valley Electric Corp., St. Louis, Missouri. Here, the No. 12 Automatic Production Lathe is handling 18 sizes of electric motor frames—both cast iron and steel—boring or turning rabbet fits on three different types of work pieces.

Let's look at the machining cycle on a typical frame. Slipped on an air-operated expanding mandrel, located against an air-operated automatic retracting locator on the headstock, the work is chucked in the I.D. and supported on the right end by an arbor.

◀ Headstock-mounted front and rear auxiliary slides are operated by forward movement of standard front carriage and rear independent slide.

The locator retracts to clear the part and the cycle begins.

To machine the motor frame simultaneously at both ends, special headstock-mounted auxiliary slides are used, operated by forward movement of the front carriage and rear independent slide. Facing, rough-turning and chamfering are handled from the rear independent and rear auxiliary slides, while the front carriage and front auxiliary slides finish bore and chamfer. F.t.f. times range from less than one minute on the smallest part to three minutes on the largest part handled.

Inner rabbet fits are machined on parts from 7½" to 10⅛" O.D. and 2½" to 6" wide, and outer rabbet fits are machined on parts from 6½" to 12¾" O.D., and from 4¾" to 10" wide.

GISHOLT

MASTERLINE GISHOLT SINCE 1887

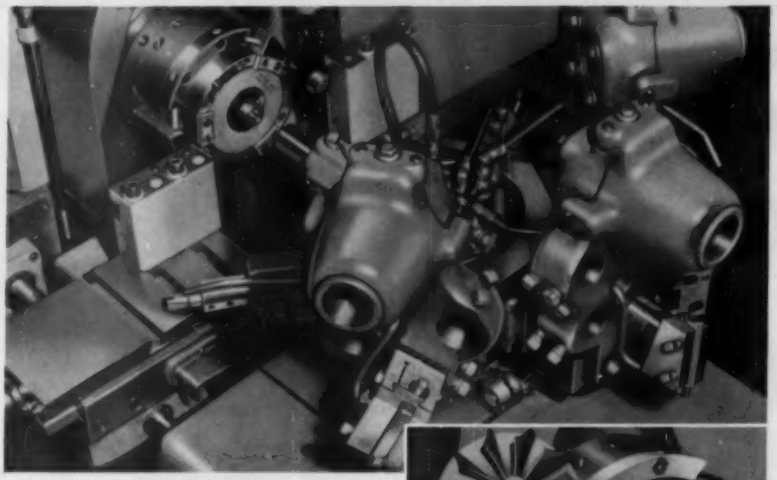
TIME-SAVING IDEAS

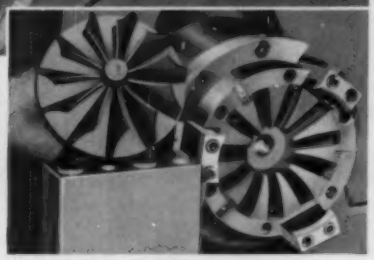
CUMMINS ENGINE CO., INC. MACHINES STELLITE PART 25% FASTER

Uses the 1F Fastermatic with special chucking fixture to simplify turbine wheel machining.

This turbine wheel casting, used in Cummins Turbojet Diesels, is made from Haynes Stellite No. 31—an exceptionally hard material offering high resistance to heat and oxidation. To get the accuracy required and handle a heavy forming cut on the hub radius, the part has to be driven from the back side with very rigid support. The vanes make standard chucking methods impractical. Here is how Cummins Engine Co., Inc., Columbus, Indiana, machines this part accurately in only 12 minutes f.t.f., 25% less than the 16 minutes required previously.

A special air-operated fixture holds the work in a molded plastic driving nest, formed to fit the contour of the turbine wheel and vanes. The 5⅞"-diameter, 2⅞"-deep part is accurately located and centralized in this driving nest, and clamped on the outer face with three drawback fingers. Hexagon turret tools drill, bore, face, form and turn the piece, leaving stock for grinding. Front and rear cross slide tools rough and finish-face the hub. A two-speed motor provides the correct low speed on the forming cut for finer finish and longer tool life.



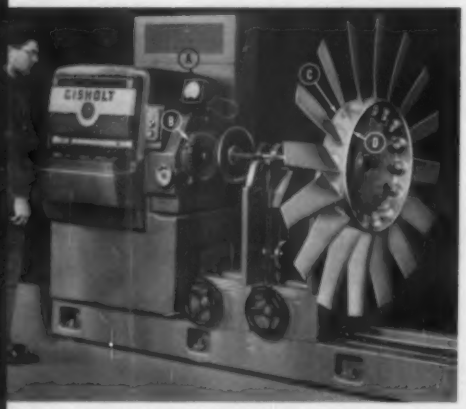


Special plastic driving nest gives positive location, centralizes part, provides maximum rigidity. Tough material is machined in less time through Fastermatic's smooth hydraulic feed, with tools reground only once for each eight-hour shift.

Finished workpiece in fixture. Piloted turning heads give maximum tool support. (Inset) Accurate location and rigid support provided by plastic driving nest which holds turbine wheel (in hand).

HOW JOY MFG. BALANCES FANS MORE ACCURATELY, FASTER, CHEAPER

Handles large fan rotor assemblies in overhang position on 2U Balancer, obtaining two-plane balancing



Workpiece rotated on balancing arbor outside the work supports. Correction made at C and D. (Shrouding, which reduces air turbulence, removed for photo.)

You'll get ideas from this balancing job—it shows how Joy Manufacturing Co., New Philadelphia, Ohio, has improved accuracy and reduced balancing costs. They are using a new Gisholt 2U Balancer to handle large axial flow fan rotor assemblies up to 66" diameter and weighing 40 to 105 pounds.

Since the large-diameter workpieces do not have their own shafts, a mounting arbor is placed between the work supports with a full bearing and a counterweight on the left support, to keep the center of gravity between the supports and prevent "lift" during work rotation. The parts are simply slipped on the arbor end and balanced in the overhang.

Operation is simple: The part is loaded and rotated at balancing speed. The amount of unbalance in each correction plane is read on the direct reading amount meter (A), which indicates unbalance in terms of the correction method being used. Although the correction planes are only 1¾" apart, unbalance cross effects are eliminated by the balancer's electrical networks and do not affect machine accuracy. Angle of unbalance is clearly indicated on dial (B). Correction is by adding weight at both edges of the turbine blade mounting rim at the indicated angles.

Close balancing tolerances are easily held. The new Type U Balancer provides ample swing (68") for largest parts with no decrease in accuracy whether balancing operations are performed with the work between or outside of the standard work supports.

No. 9-1057
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THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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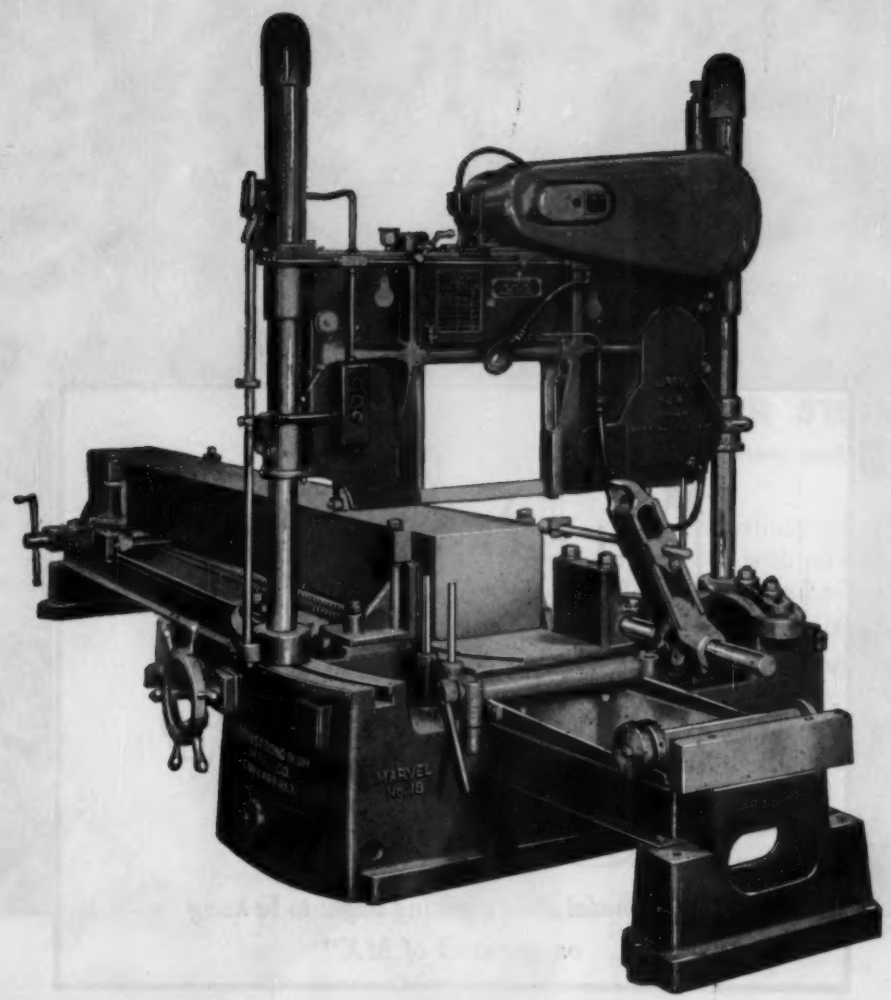

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for MARVEL "*Giant*" Hack Saws

These giant MARVEL Hydraulic Hack Saws (No. 18, Capacity 18" x 18"; and No. 24, Capacity 24" x 24") were *basically* designed for rapid and economical cut-off of BIG WORK. They are not merely "conventional" designs "stretched" to big capacity. They are truly designed and built with the ruggedness and rigidity necessary to withstand the rough treatment of sawing big work, even though the work is in the "toughest of the tough" alloys.

They are reliably fulfilling the cut-off requirements in innumerable steel mills, forge shops, structural shops, warehouses, and machine shops, with assured low tool cost and minimum kerf loss of steel.

In addition to cutting-off, they are reducing costs by eliminating further machining operations. Heat treated die blocks are being reclaimed for re-sinking by sawing off the worn face; columns, beams, pipe, and tubing are being sawed to *finished*, square ends, eliminating milling; angular sawing is done conveniently by swinging the upper structure on the base, to any angle up to 45 degrees—*without moving the work*.

Contemplating the modern trend toward ever tougher steels and larger sizes, these are the logical sawing machines to buy, not only for today's needs but for tomorrow's as well.

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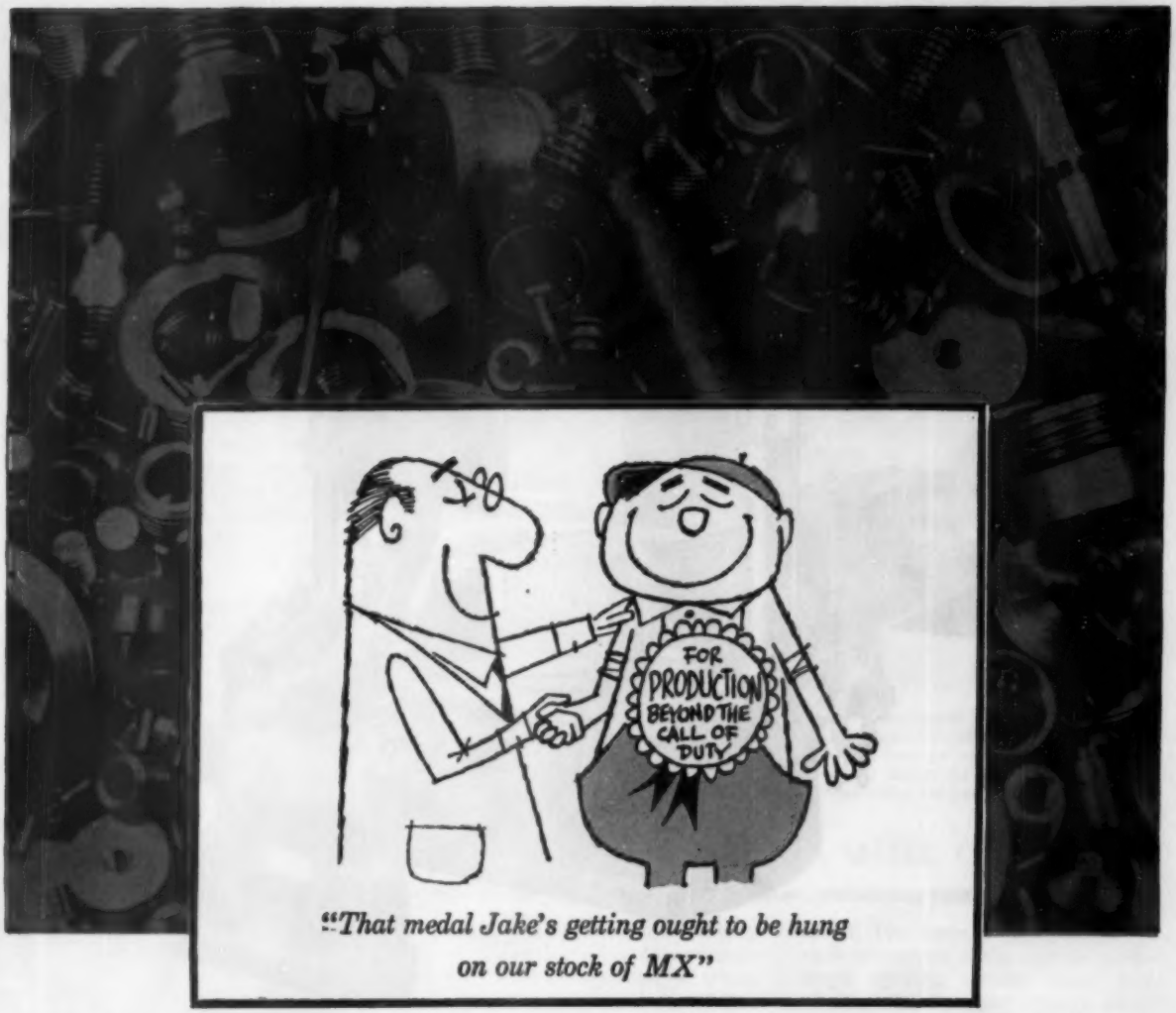

"That medal Jake's getting ought to be hung on our stock of MX"

To hang up production records takes more than modern equipment and experienced operators. You've got to use screw stock that makes it possible for both to perform at top efficiency.

That's why so many shops have switched to USS Free-Machining MX Steel. With this faster-cutting screw stock, production increases of 50% or more are not unusual . . . tool life is extended, frequently doubled, and down-time is correspondingly reduced.

What's more, with MX on the job, screw machine parts are not only turned out in record time but, because MX is consistently uniform in cutting characteristics and in freedom from injurious imperfections, parts made with MX are *better* parts—better in finish, accurate in dimension and with fewer rejects to cut into profits.

USS Free-Machining MX Steel has been successfully machined at speeds up to 350 SFM—yet it costs no more than regular screw stock.

Based on results obtained in producing more than a billion parts of many different kinds and under widely different conditions, we feel sure that *MX will cut the cost of any part* you now machine from regular screw stock grades. Why not prove it for yourself?

Available both in Bessemer and Open Hearth grades, USS Free-Machining MX is produced in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our nearest district office.

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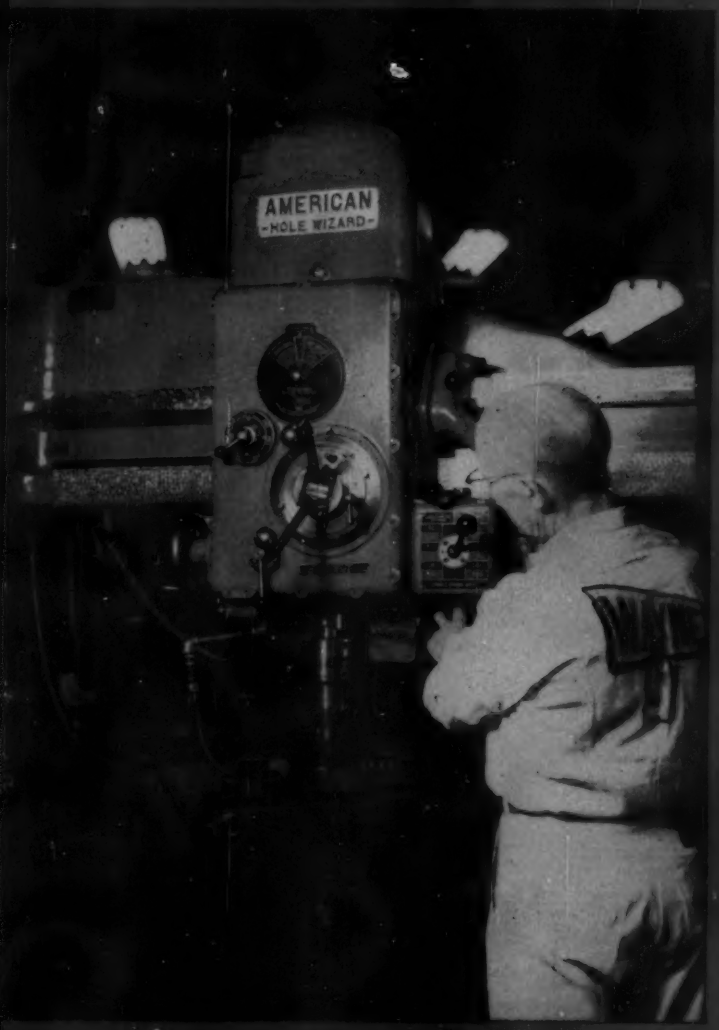

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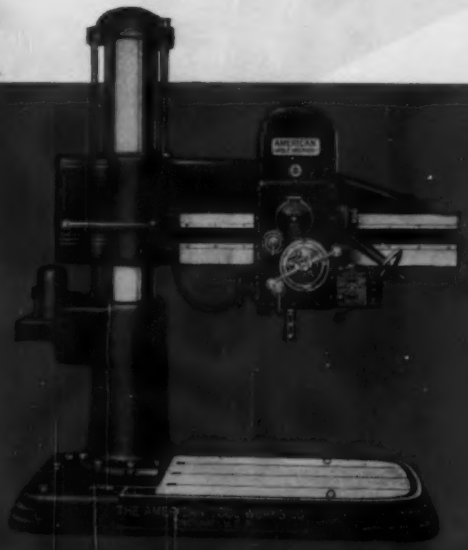
Using an assortment of well designed drilling, boring, reaming, tapping, spot-facing and chamfering tools in combination with the "AMERICAN" Hole Wizard's power, rigidity and predominant ease of operation, spectacular savings have been recorded over previous horizontal boring mill methods.



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

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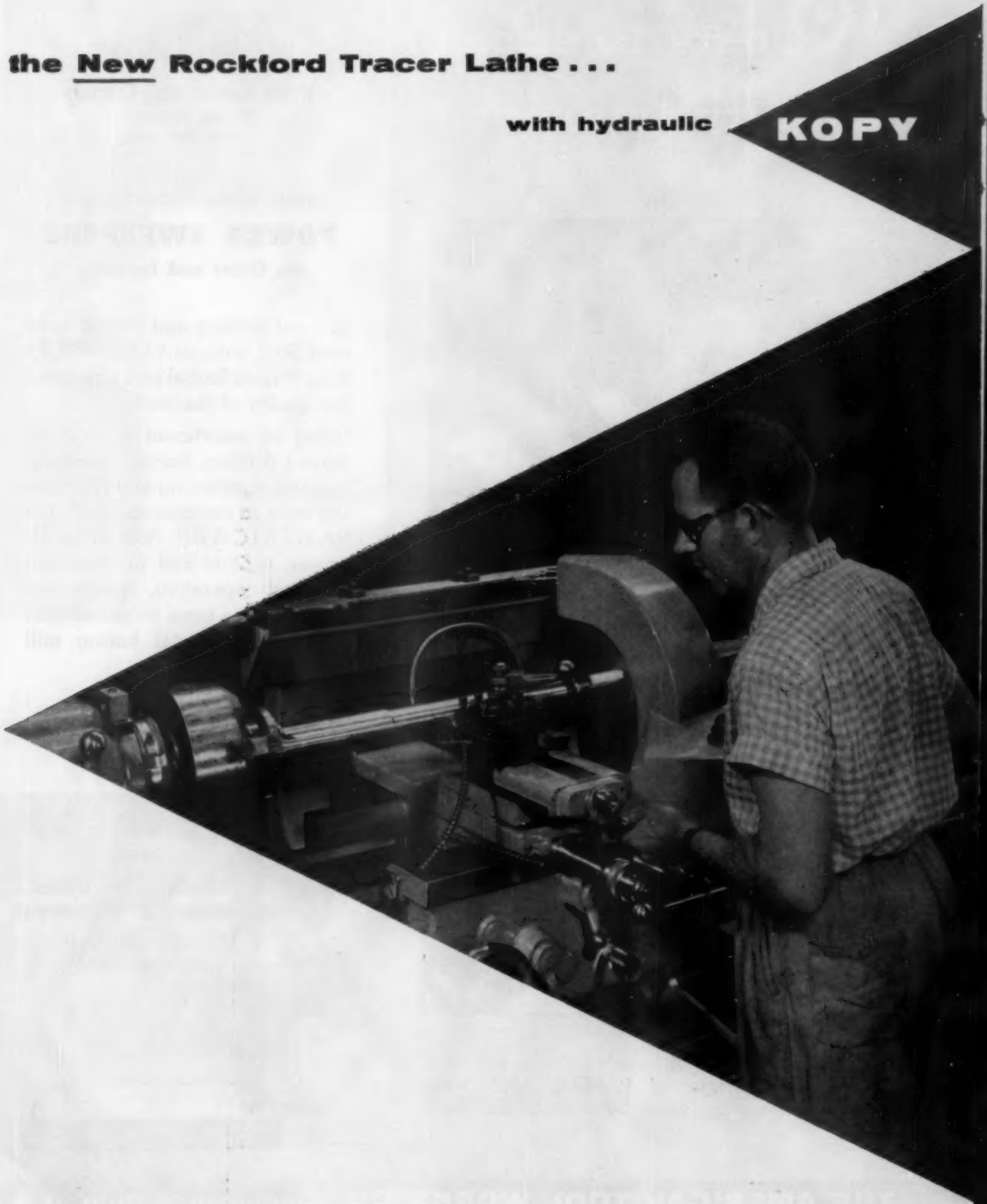

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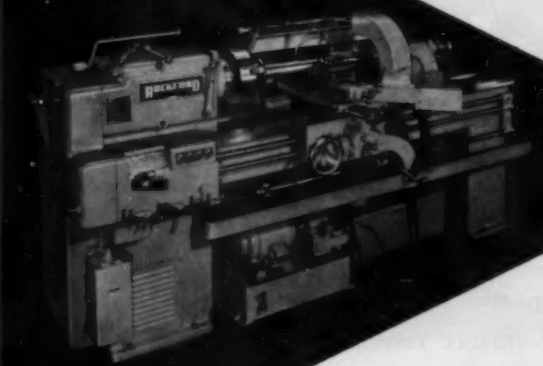

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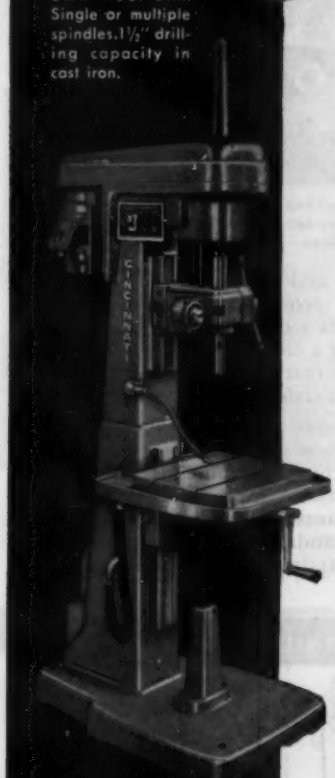

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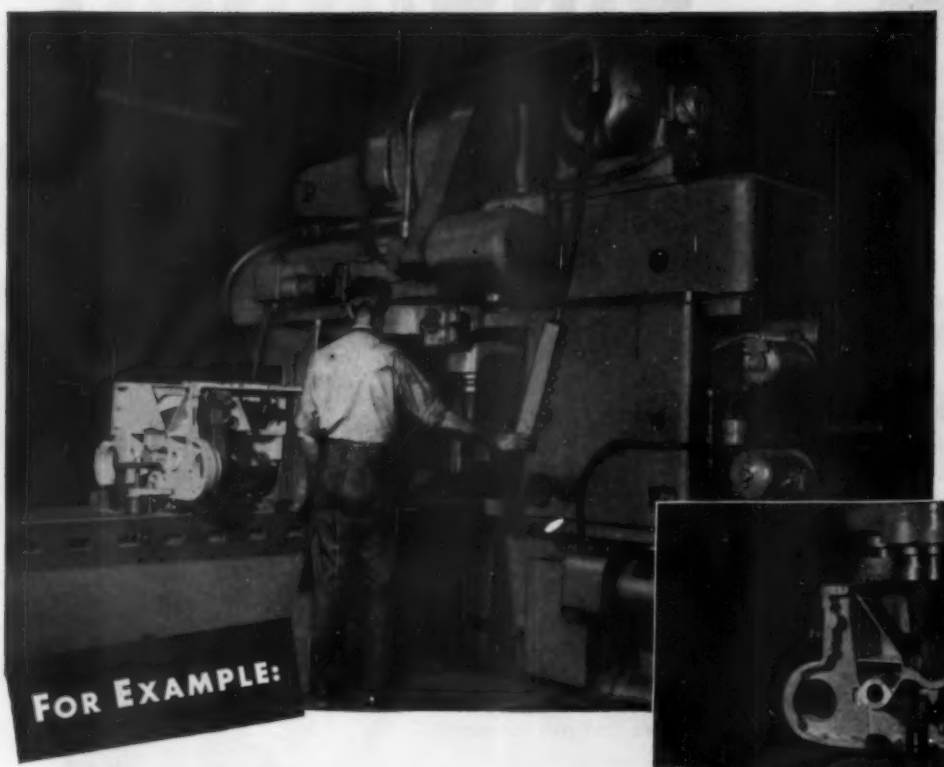
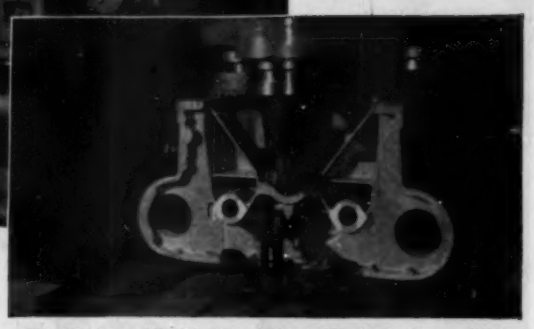




This Sundstrand Rigidmil has horizontal spindles for machining opposed faces and a three-spindle head on crossrail for machining different crankcase surfaces.

This Sundstrand Rigidmil Increased Production 25%

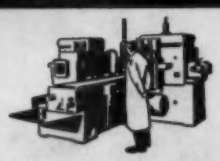
Faster cycling, pushbutton control, improved accuracy and finish due to precise, rigid construction, are major benefits being realized at LeRoi Division, Westinghouse Air Brake Company, Milwaukee, in machining castings for internal combustion engines and compressors on this Rigidmil. Scrap and rework are reduced because the complete processing cycle requires only the depressing of a single pushbutton on the pendant control. Additional versatility is provided by horizontal spindles on the columns that insure economical and accurate machining of parts with opposed faces.

Sundstrand "Engineered Production" can improve production and quality on your job, too, by providing you with the machines and processing techniques required to handle your products most efficiently. Because Sundstrand builds a complete range of milling machines, as shown by a few examples on the facing page, you can be sure that you are getting the one best machine for your needs.

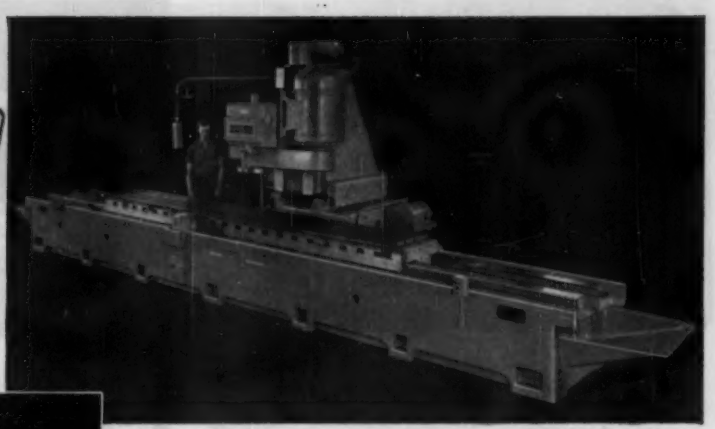
All the factors—economic as well as technical—are carefully analyzed by Sundstrand process and design engineers before a machine recommendation is made. Automotive, aircraft, farm implement, tractor, and railroad equipment plants are among those meeting exacting production standards on long-run or small-lot jobs with a big assist from Sundstrand "Engineered Production!"

SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

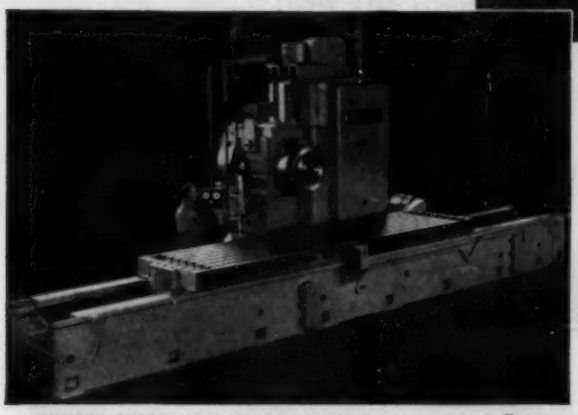
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS



Shown here are a few of the standard machines that can solve your milling problems when applied with Sundstrand "Engineered Production."



VERTICAL RIGIDMIL—Power vertical adjustment to spindle head, endwise quill adjustment, and cross adjustment to spindle head carrier are features contributing to easy adjustment and simple setup over a wide work range.



SIMPLEX RIGIDMILS—Table feed strokes ranging from 24" to 216" and spindle motors from 3 to 100 hp permit picking the ideal machine for widely varied materials and sizes of cutters.

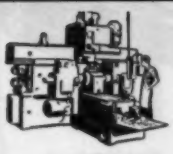
DUPLEX RIGIDMILS—Fixed or adjustable column types enable opposed faces to be machined with maximum accuracy and economy. Adjustable column machines mount spindle heads on movable columns for cutting rigidity over wide work range.

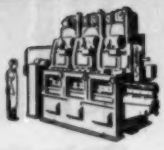
ROTARY TABLE RIGIDMIL—
Way-type cross adjustment of spindle head carrier and way-type vertical adjustment to spindle head provide maximum support to cutter for large or small parts.

UNIVERSAL RIGIDMIL—Recent addition to Rigidmil line, the universal bed-type machine, has both a horizontal spindle head and an all-angle, ram-type head making possible wide range of cuts at all angles.

Additional Facts on how "Engineered Production" is applied to the complete line of Sundstrand Machine Tools is available in Bulletin 183. Write for your copy today.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

"Engineered Production" Service

FOR BROACHING

It takes all 3

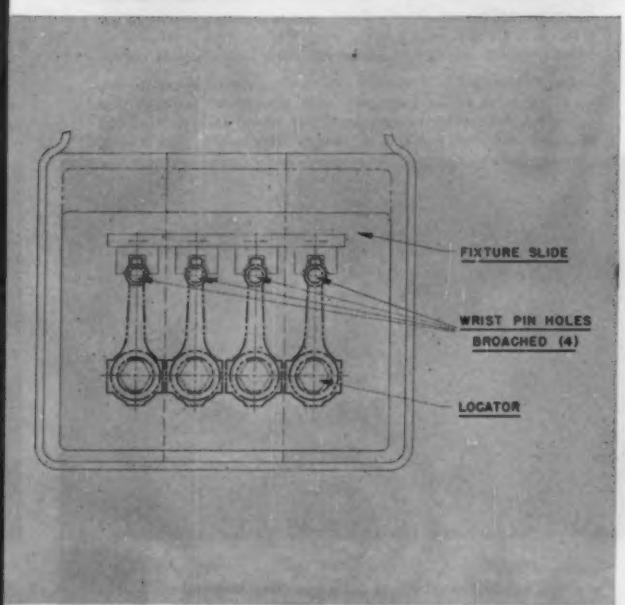
American's "Engineered Production" Service . . . gives the broach-user the complete three-part service that is essential to obtain the most practical broaching method. Years of design and production engineering experience, unavailable at any price, are effectively added to your staff at no extra cost.

THE JOB—Broaching I.D. of wrist pin hole in connecting rods.

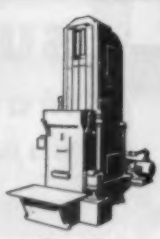
THE RESULT—Four pull broaches on an American Vertical Hydraulic broaching machine finish the holes at a production rate of 600 parts per hour.

1 PROPER BROACH TOOL DESIGN

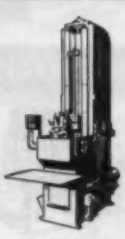
Top-quality results on any broaching operation require starting the job with design of the broaching tool itself. In solving this all-important first step, American Broach considers stock removal, length and width of cut, finish tolerances required, etc. High-quality work and long tool life result because broach and machine are designed to operate as a team. Broaches are pulled through four at a time to finish the wrist pin holes at the required rate.



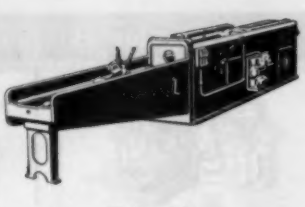
Broaching Tools



Three Way



Single Ram



Horizontal

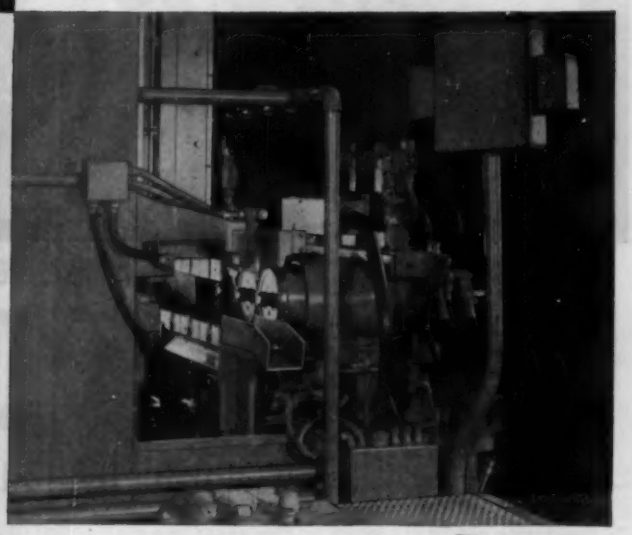
to give you peak broaching performance

2 SPECIFYING THE RIGHT MACHINE

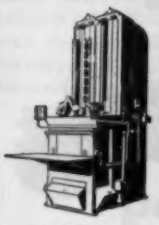
Production rate required, length and speed of stroke, relationship to other production machinery, available floor space, etc. determine the selection of the broaching machine capable of doing the best job. At American, machine selection follows design of the broaching tool. This vertical hydraulic single-ram surface broaching machine is equipped with an automatic transfer mechanism that carries three parts from the conveyor line into broaching position and ejects them after broaching. Interlock prevents machine operation unless three parts are in the transfer mechanism.

3 EFFICIENT FIXTURING

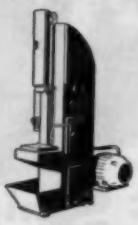
Whatever your part geometry or hourly needs, fixturing by American Broach forms the vital third link in the production chain. The three-station fixture shown in the close-up provides positive clamping of the workpiece for broaching. In addition, it recedes at the end of each broaching pass and indexes 90 degrees for the second pass. On high-volume jobs like these, even with relatively inexperienced operators, production schedules are maintained because the "skills" are built into the tool, machine, and fixtures.



For more information on practical broaching methods, write for Bulletin A117.



Duplex Ram



Presses

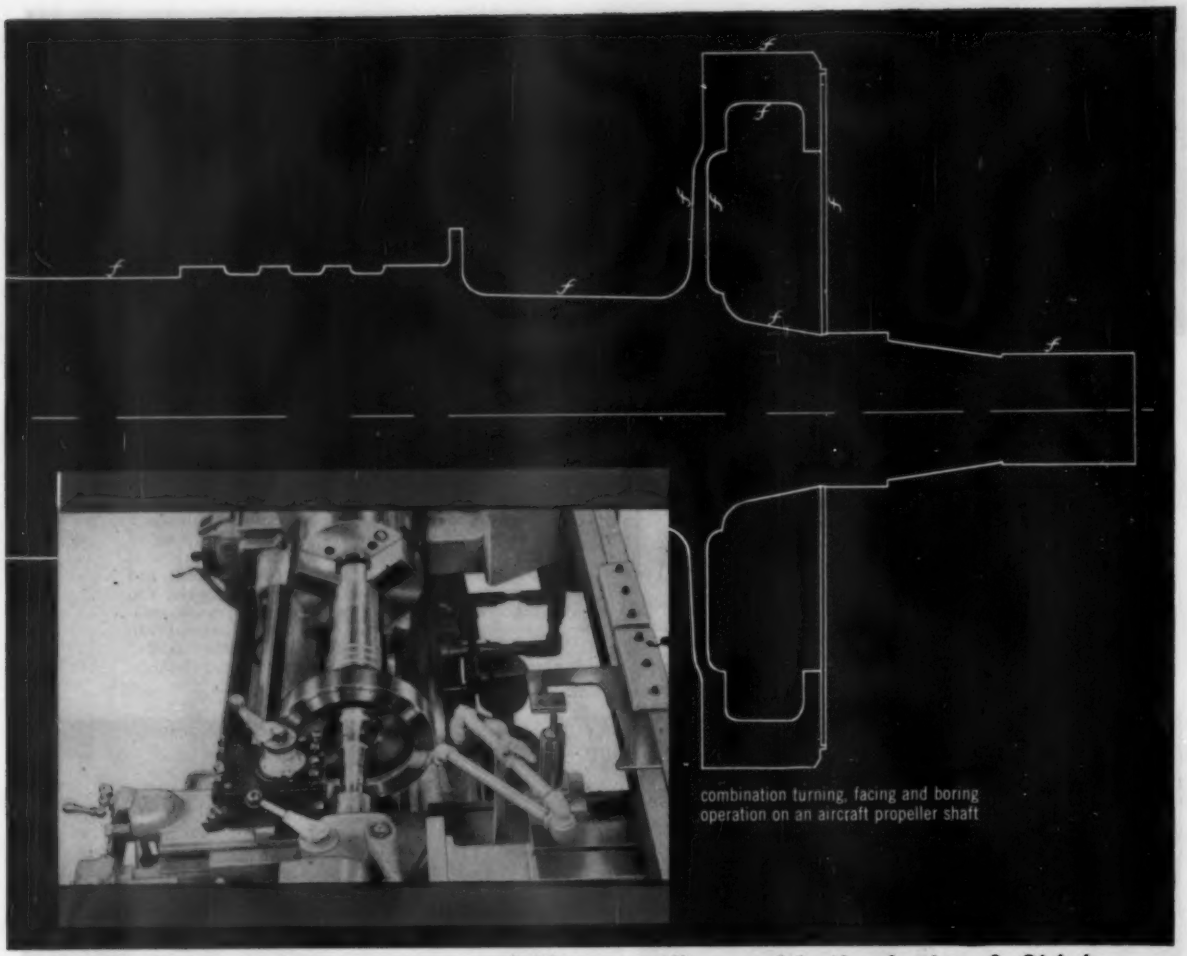
SUNDSTRAND

American

BROACH & MACHINE DIVISION

SUNDSTRAND MACHINE TOOL COMPANY

ROCKFORD, ILLINOIS



combination turning, facing and boring operation on an aircraft propeller shaft

Duplicate complex curves . . . quickly . . . easily . . . with the Lodge & Shipley

DUAL TRACER

lathe and all-hydraulic 360° control

The machining of complex contours on the periphery, bore or face of a workpiece is the job for which the Lodge & Shipley DUAL TRACER was perfected. In addition to this facility, the DUAL TRACER can handle conventional tracing jobs or can be changed over almost instantly to standard lathe operation. This versatility removes the DUAL TRACER from the limited use that makes the "special lathe" an uncertain investment.

Chances are the DUAL TRACER can do your job faster and more economically. Consult our sales engineering department. For details, write: **The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.**

your LODGE-ical choice . . . **Lodge & Shipley**

New Model D Single Dial CompAIRator. Available with instrument mounted gaging; or for remote connection to machining operations for in-process or post-process gaging.

New Model E. For the first time, a low-cost version of standard Taft-Peirce circuits so you can cut costs by using air gaging for many more inspection operations. Has external tolerance hands and compact cabinet. Same accuracy, same dependability — the biggest air gage value on the market.

HIGH PERFORMANCE Air Gage Line

...the TAFT-PEIRCE Model D CompAIRator

Here's another big improvement in air gaging. The well-known CompAIRator has a completely new functional design that gives you 3 big advantages: — makes air gaging easier to read, easier to use and easier to trust!

EASY TO READ — Special visor and slanted face cuts glare and reduces parallax — speeds the gaging operation. Dial has full 180° linearity.

EASY TO SET UP AND USE — Zero and range setting knobs are within easy reach of the operator. Plus, compact chassis, and simplified dial and magnification changes. The Model D can be set and used at any angle, moved easily because it's light. Can be racked or modulized.

EASY TO TRUST — Yes, you can place full confidence in the new design because it uses the proven T-P Velocity-Venturi Circuit. Repeats readings without variation, has exceptional speed of response and is readily adaptable to many special uses, including wide tolerance gaging.

Modernize your gaging with this new CompAIRator. Or, ask a Taft-Peirce representative to demonstrate the new T-P CompAIRator — you'll be amazed at the performance.

TAKE IT TO TAFT-PEIRCE

THE TAFT-PEIRCE MANUFACTURING CO., WOONSOCKET, R. I.

T-P Means TOP Precision

this modern

CLEVELAND PRESS

embodies every essential feature for

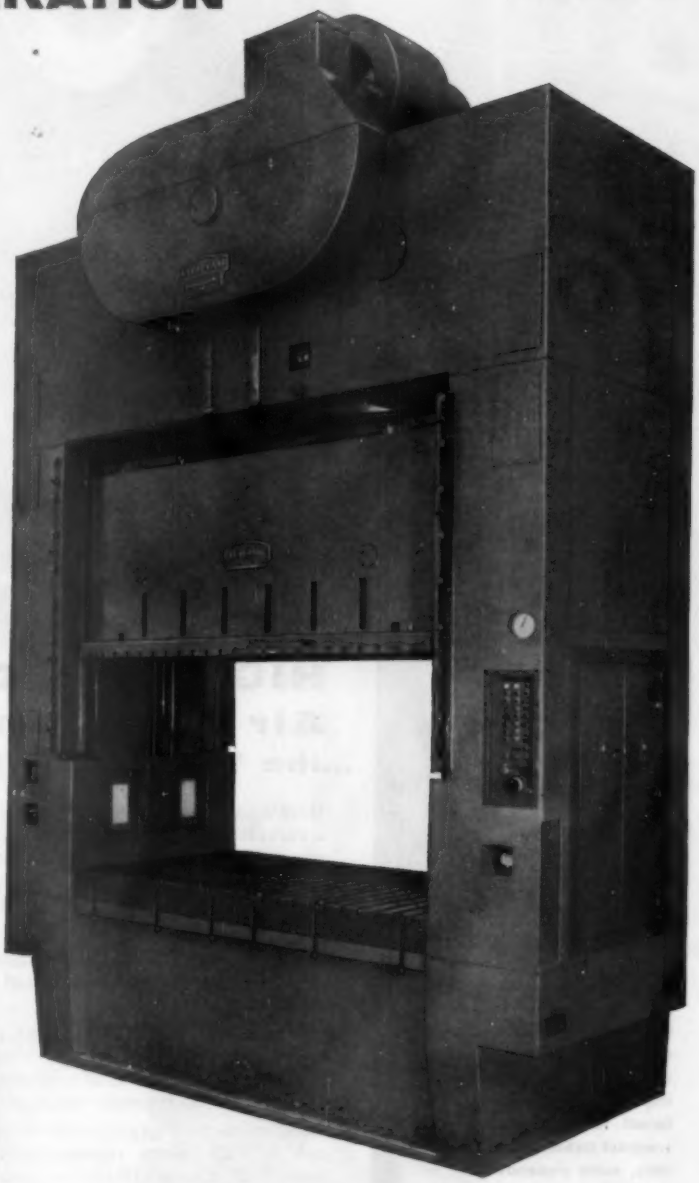
EFFICIENT OPERATION

Recently installed in the plant of a leading automotive manufacturer, this Cleveland Four Point Press is designed to produce several different types of automotive stampings.

Features on this press are:

- Electrically controlled air-operated Cleveland (patented) Drum Type Clutch with spring loaded brake
- Air counterbalanced slide
- Pneumatic cushion in the bed, with controls for separate operation
- Auxiliary air brake on flywheel
- Lighted die area
- Gears completely enclosed, spray lubricated
- Stroke indicator
- Built to JIC Standards

Cleveland Four Point Presses can be furnished in a wide range of sizes, with capacities to suit particular requirements by modifying the stroke, adjustment, bed and slide areas. All models have this in common — maximum accuracy and die life . . . minimum maintenance and per-part costs . . . that's why it pays you to look into the advantages Cleveland Presses offer.



500-ton capacity, 24" stroke with 15" adjustment; shut-height 61½"; slide and bed both 72" x 144".

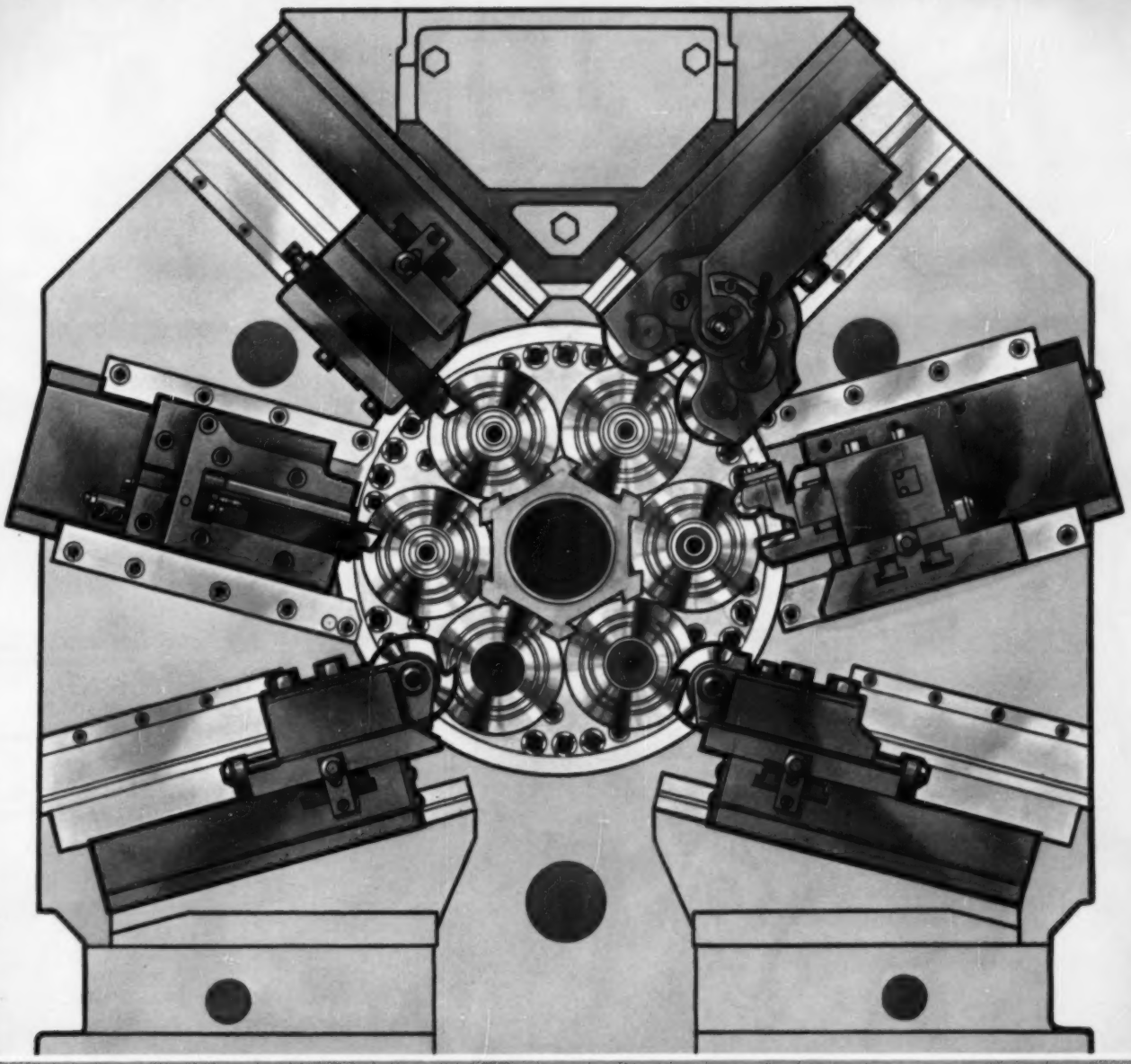
THE CLEVELAND PUNCH & SHEAR WORKS CO.
Established 1880

Power Presses
Fabricating Tools
Punching Tools & Dies

E. 40th and St. Clair Avenue, Cleveland 14, Ohio

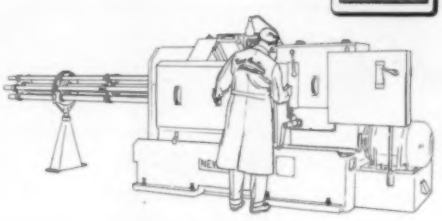
Offices
NEW YORK
DETROIT
CHICAGO
PHILADELPHIA
EAST LANSING
CINCINNATI

AA-6519

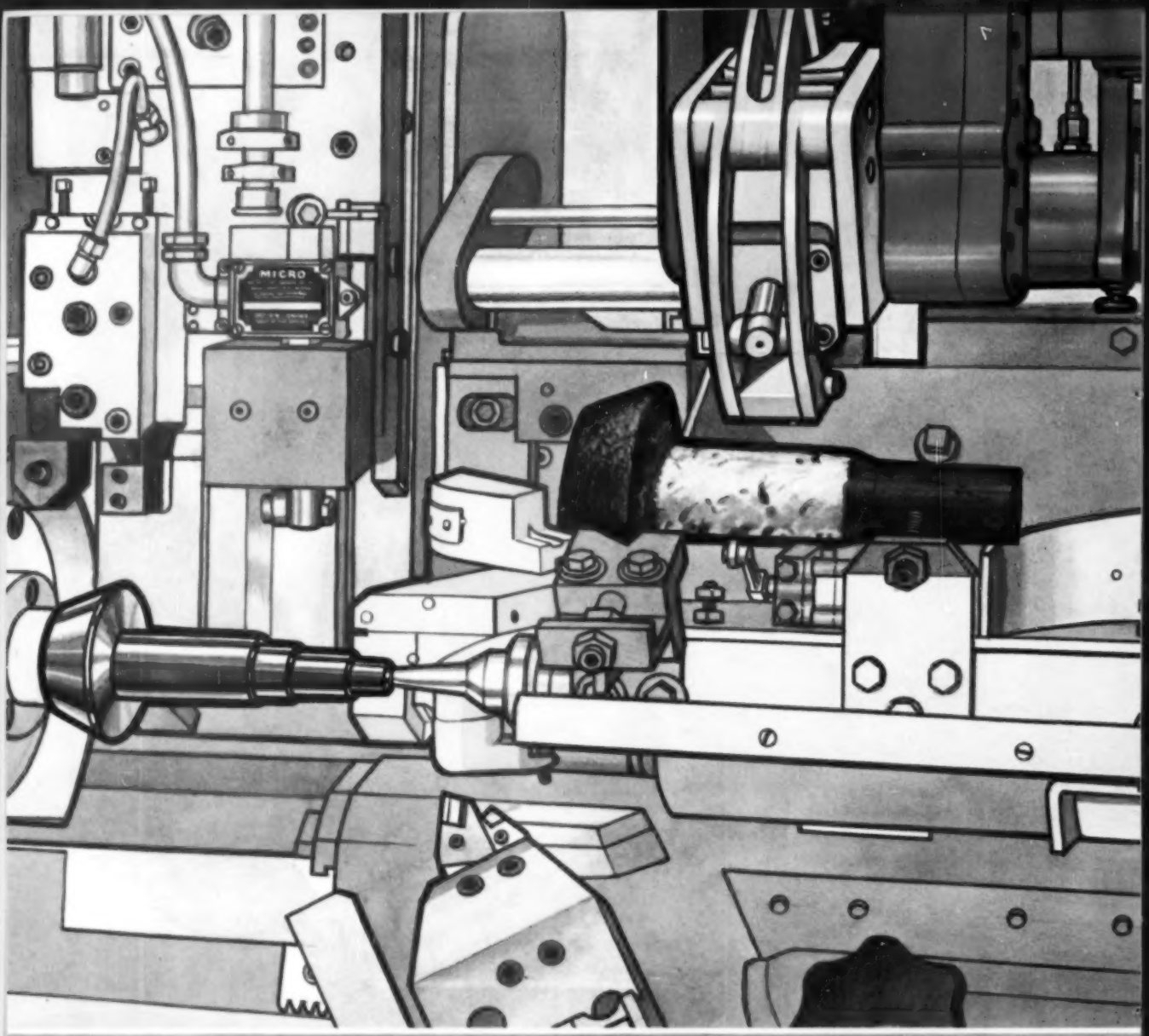


six spindles — six cross slides

Here you see the possibilities for new flexibility of bar machine set-ups with *a cross slide in every position.* Six independent cross slides. More operations on one bar machine. Six independent radial cross slides for forming, roll threading, shaving, skiving, angular facing, knurling, hobbing and undercutting with simpler tools and attachments, through the use of cross slides. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



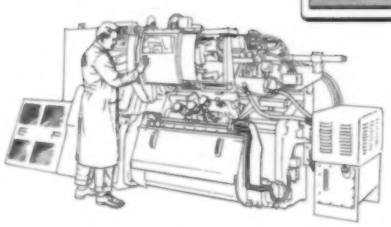
Automatic Bar Machine



no hands — no headaches

Automatic loading of forgings, bar slugs and bar stock is a basic optional design feature of New Britain +GF+ Copying Lathes. It saves labor and makes a substantial reduction in production time per piece.

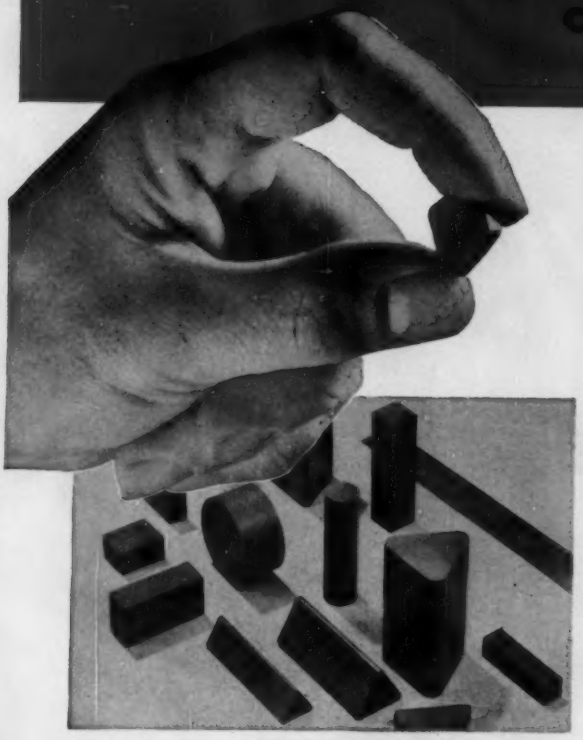
Positive, accurate loading, single point tooling and template control mean fewer headaches and larger profits on your lathe work. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



New Britain +GF+ Copying Lathe

Not once–BUT AGAIN AND AGAIN

production is increased . . . costs are reduced . . .



with

STUPALOX
oxide cutting tools

To get the facts, actual field tests were made comparing the performance, machining speed and economy of Stupalox oxide-base metal-cutting tools with previously-used materials. Again and again, Stupalox cutting tools outstripped all others —production was multiplied . . . machining time and costs were slashed.

And that's not all. Performance was outstandingly superior. The extreme hardness and high strength of Stupalox resulted in deeper cuts, smoother finishes and longer tool life. Good results were obtained even with materials previously classified as "unmachinable."

And remember this, *when production goes up and costs go down capital investments in machines and floor space can be reduced.*

CASE HISTORY No. 101

Turning Broach Blanks from 3⅛" diameter hot-rolled, M-2 H.S.S. Rockwell C-22-26 with Boye & Emmes Engine Lathe.

Results: With Stupalox tool inserts, the total cost of machining was cut from $12.53 to $3.61 per piece.

CASE HISTORY No. 103

Turning O. D. of Bearing Sleeves from Stress-Proof Steel, Rockwell "C" 20-25, using Monarch 18" Engine Lathe.

Results: Using Stupalox, production was boosted and machining cost reduced more than 50%.

CASE HISTORY No. 105

Rough and semi-finish bore 12" cast iron cylinder liner on a LeBlond 24-20 Lathe.

Results: Production per hour was more than doubled, cost per piece was cut from $2.26 to $.92 when Stupalox was used.

STUPAKOFF DIVISION OF **The CARBORUNDUM Co.**

WRITE DEPT. AM LATROBE, PENNSYLVANIA

More than thirty years of research and development on special purpose oxides are behind the remarkable success of Stupalox Oxide Cutting Tools—*now available in commercial quantities and in a variety of sizes and shapes.*

For further details on these and other actual case histories mail this request TODAY!

STUPAKOFF Division of
The Carborundum Company, Latrobe, Pennsylvania

Please send copies of the above case histories and other data on Stupalox oxide cutting tools.

Name_____ Title_____

Company_____

Address_____

Now—*from Behr-Manning's*

New "SPUR-ACTION" abrasive belt cuts 25% Faster.

Removing excess material from a cast brass spring housing for a pressure reducing valve is fast and easy with a new "81-Coat" Resinall Metalite abrasive belt. The new Behr-Manning abrasive belts not only do a faster stock removal job but also stand up longer than any previously used.

"Abrasive Tech"—

BEHR-MANNING CO., TROY, N. Y.

☐ Please have a Field Engineer contact me to arrange for a demonstration of your new "81-Coat" belts and discs.

☐ At my plant ☐ At your nearest "Abrasive Tech" Branch Methods Room

*Name*_____

*Company*_____

*Address*_____

*City*_____ *Zone*_____ *State*_____

"81-COAT" Abrasive Belts and Discs outlast all others by as much as 50%

From the Research Laboratory of Abrasive Tech comes an entirely new way of making coated abrasives—"81-Coat."

It gives a new toughness . . . a new sharpness to abrasive belts and discs. It gives them "Spur-Action"—hundreds of rougher, tougher cutting "spur" points per square inch for fastest stock removal.

And for greater endurance, greater resistance to grinding heat, and longer life, it provides the strongest resin bond ever attained for abrasive belts and discs.

Feel the difference . . . see the difference . . . profit by the difference. Just mail the coupon to arrange a demonstration of new "81-Coat" belts or discs on your toughest job . . . to spur more production, more mileage per belt—*at no increase in price!*

BEHR-MANNING CO.

TROY, N. Y.

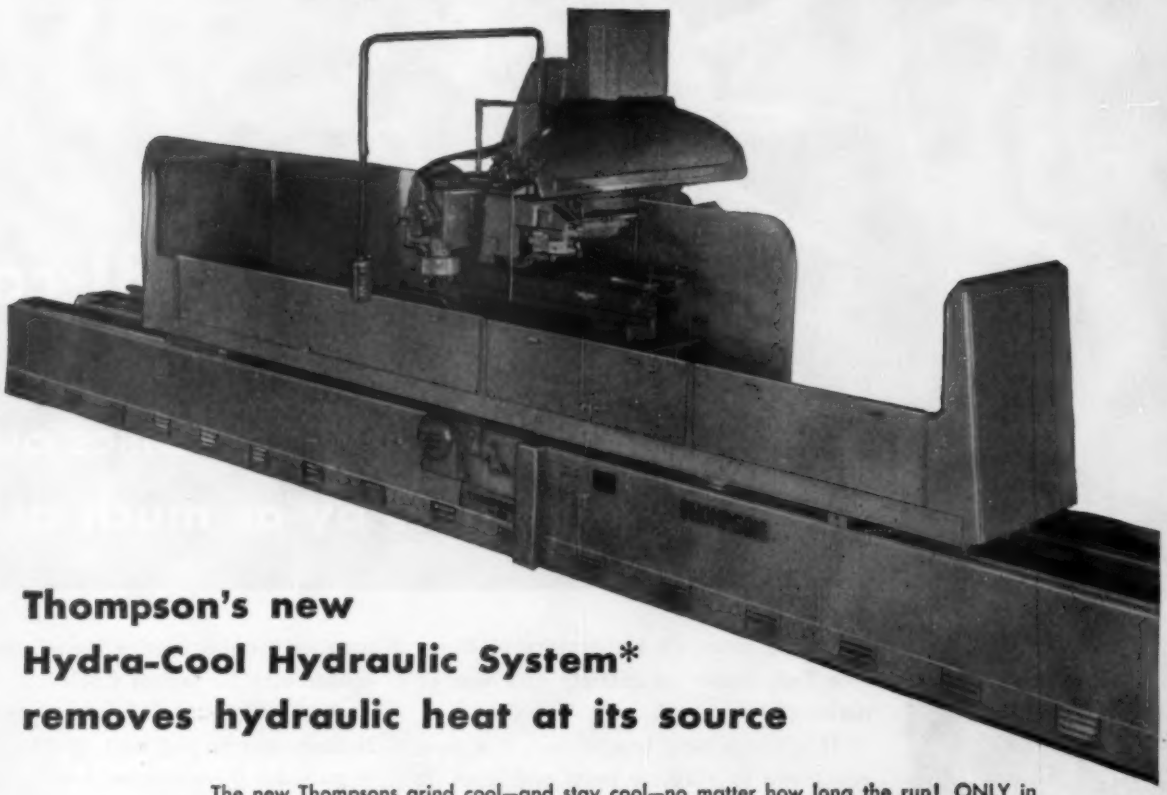
A DIVISION OF NORTON COMPANY

NORTON ABRASIVES

BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes
NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
In Canada: Behr-Manning (Canada) Ltd., Brantford. For Export: Norton Behr-Manning Overseas Inc., Troy, N. Y., U.S.A.

BEHR-MANNING ®

HYDRA-COOL



Thompson's new Hydra-Cool Hydraulic System* removes hydraulic heat at its source

The new Thompsons grind cool—and stay cool—no matter how long the run! ONLY in this new hydraulic system can you get these important, exclusive advantages—

- Hydra-Cool eliminates heat damage to the hydraulic seals, valves, controls and pump.
- Hydra-Cool will not break down the additive-type hydraulic oils—sludge will not form in the Hydra-Cool System.
- Hydra-Cool eliminates the usual lengthy warm-up period required to bring production surface grinders up to working temperature.
- Hydra-Cool saves you money on power costs.

Hydra-Cool is standard on all Thompson surface grinders 40 inches and up in work length AT NO EXTRA COST.

*Pat. Applied For

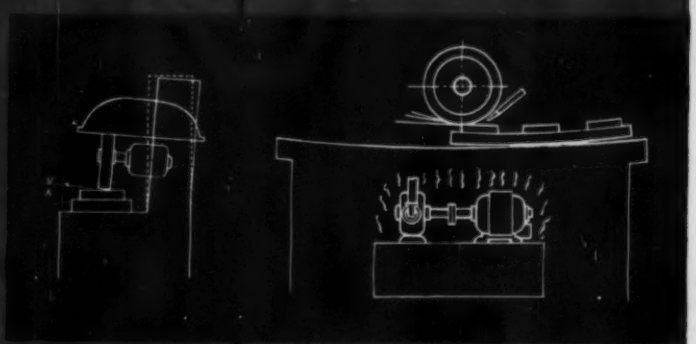
"KEEP Thompson IN MIND FOR THAT DAILY GRIND"

Constant

ASSURES ACCURACY

HEAT DISTORTION IS ELIMINATED IN THOMPSON SURFACE GRINDERS

As shown at right, heat distorts the column of a surface grinder from its true vertical alignment, causing the column to bend back from the work table. This further destroys the machine's accuracy.



HOW HEAT DISTORTS A SURFACE GRINDER

Coolant, splashing and evaporating on the work table, cools the top surface, which contracts. Hydraulic heat, ranging from 50° to 70° above ambient temperatures, heats the bottom surface of the table, which expands. This causes the whole table to become concave. As shown in the exaggerated drawing above, any work being ground during this distortion is ground too heavily on the ends of the table and not enough in the middle. Surface flatness and parallelism cannot be maintained.

"No more than a few degrees rise above ambient temperature is found in the Hydra-Cool System! Distortion is eliminated—accuracy is assured."

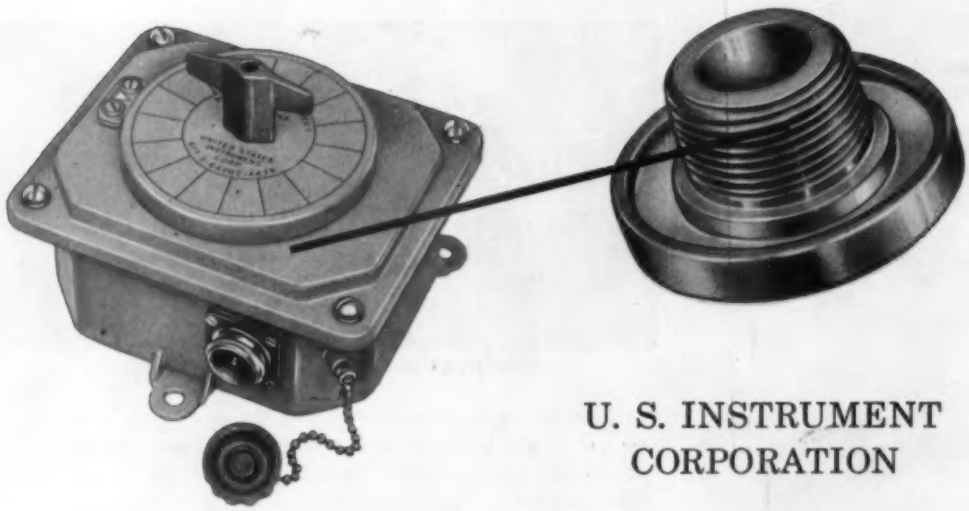
SEND FOR DESCRIPTIVE HYDRA-COOL FOLDER

The Thompson Grinder Co.
10 Zeischler Street
Springfield, Ohio, U. S. A.

Thompson
SURFACE
GRINDERS

Three more nationally known manufacturers select Mueller Brass Co. Forgeable Bearing Alloys for vital components of their products

In ever-increasing numbers, Mueller Brass Co. specialized alloys are being specified by manufacturers of top-quality products. In a series of continuing advertisements, we have presented case histories of successful applications, to which we now add three more distinguished companies who are incorporating Mueller Brass Co. forgeable bearing alloys in their products to meet the demands of widely divergent operating conditions.



U. S. INSTRUMENT CORPORATION

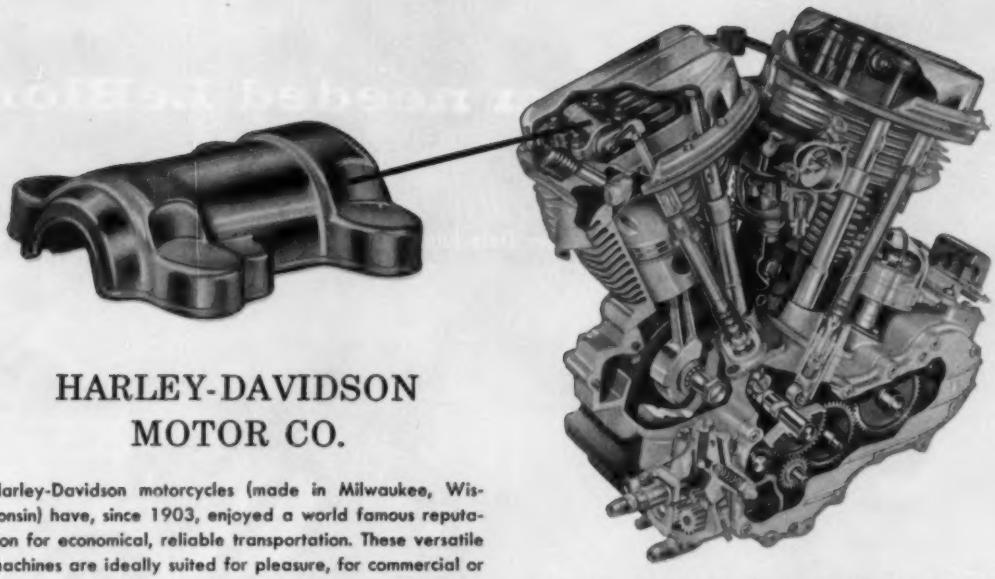
U. S. Instrument Corporation, Charlottesville, Va., selected abrasive-resistant Mueller bronze alloy bushings for their remarkable telephone selector switches after exhaustive tests of many materials. A vital communications link on today's U. S. Naval vessels, these sound-powered telephone circuits must meet rigid Navy performance-standards. Such phones, for example, must have selector switches which are capable of rotating for a minimum of 50,000 torturous cycles . . . 360° clockwise, followed by 360° counter-clockwise. In addition, the "O" ring must still form a water-tight seal AT THE END OF THE TEST! Of the many tested, a Mueller Brass Co. special manganese bronze alloy was the best one meeting these rigid specifications.

There were other important reasons why these bushings were chosen by U. S. Instrument Corporation for this application. Resistance to abrasive action against the rubber "O" ring was a prime one . . . then, too, the stem assembly suffered severe pounding through the action of the indexing mechanism which, prior to the use of the Mueller Brass Co. alloy, caused repeated seizure of the component parts. In this particular application, the part was fabricated on an automatic screw machine rather than produced as a forging. The versatility of Mueller Brass Co. alloys makes them readily adaptable to the most economical method of fabrication dependent upon the size, shape, and end-use requirements of the part.

In commenting on the success of this part, U. S. Instrument Corporation praised the alloy for its tensile strength (ordinary brasses could not withstand the 2000 ft. lb. impacts without deformation), for its machinability and corrosion-resistance.

40

MUELLER BRASS CO.



HARLEY-DAVIDSON MOTOR CO.

Harley-Davidson motorcycles (made in Milwaukee, Wisconsin) have, since 1903, enjoyed a world famous reputation for economical, reliable transportation. These versatile machines are ideally suited for pleasure, for commercial or business use, as well as the grueling demands of law enforcement work. Harley-Davidsons boast a dependable engine . . . one which can roll up an astounding mileage record with little or no care. The painstaking selection of every engine component is one important reason for this reliability. The new twin-cylinder Harley-Davidson 74 OHV employs Mueller Brass Co. bronze alloy forgings in the form of rocker-arm bearing caps. Subjected to violent temperature changes, fast starts and stops and road shock, Mueller forgings are proving again and again that they have the ability necessary to withstand almost any punishment . . . and still provide unfailing service.

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Jacobsen Mfg. Co., Racine, Wisconsin, was among the first to produce a practical power mower for home use. That was more than 35 years ago! Today, Jacobsen power-mower dependability is evident itself in more than a dozen gleaming new models such as the popular Pacer, Lawn Queen, Manor and others. One of the most reliable components in the always dependable Jacobsen hi-torque engine is a Mueller Brass Co. connecting rod forged from special bronze alloy. Jacobsen mowers with Mueller-forged connecting rods are called upon by some commercial users to operate as much as 8 hours daily, 6 days a week . . . perhaps as much as 2000 hours a year. In searing summer temperatures, thru hours of constant operation, the high uniform strength of Mueller bronze forgings constantly withstands pounding and vibration with the same conspicuous success as in its many other applications.

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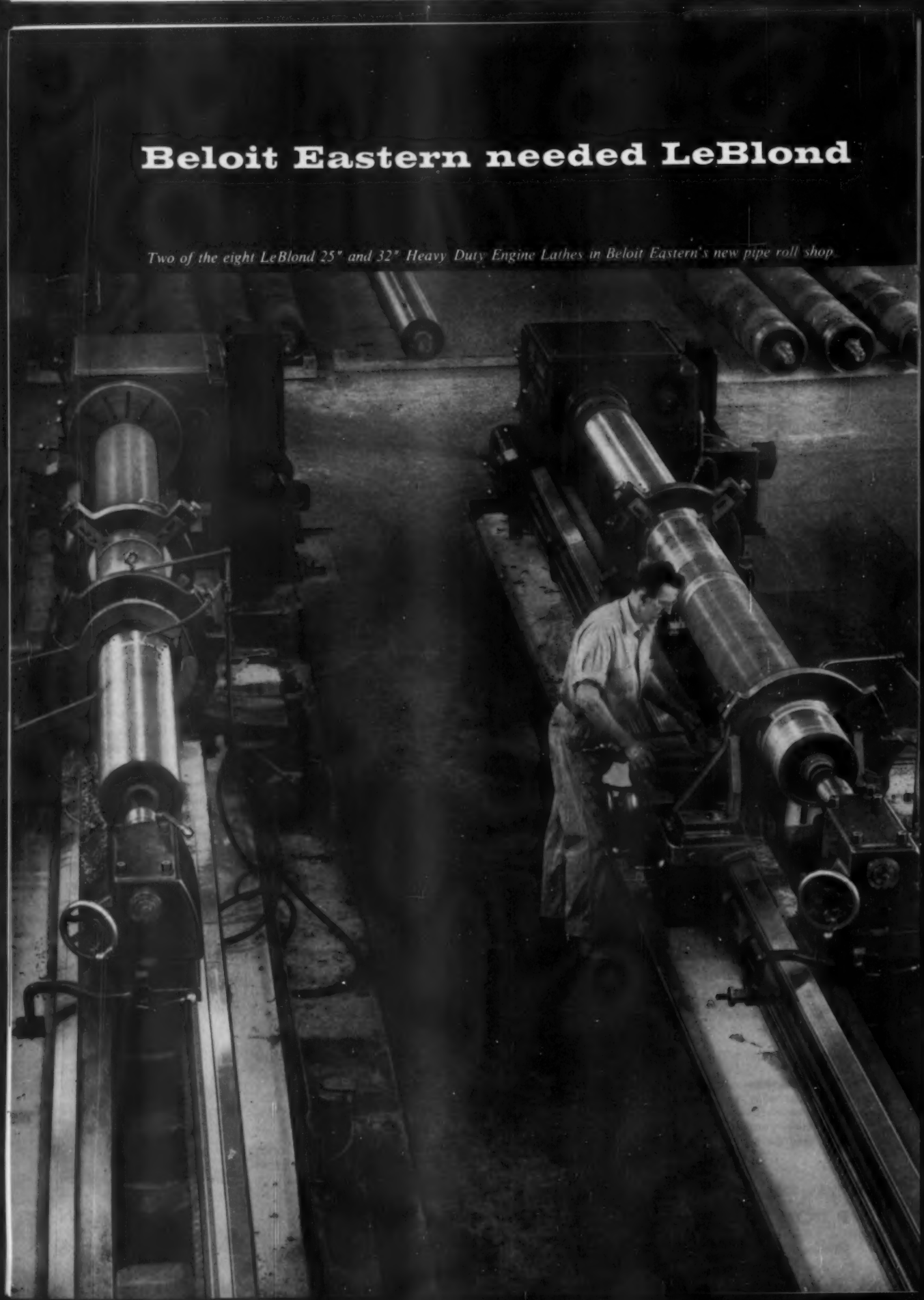
P O R T H U R O N 2 4 , M I C H I G A N

Beloit Eastern needed LeBlond



Two of the eight LeBlond 25" and 32" Heavy Duty Engine Lathes in Beloit Eastern's new pipe roll shop.

rigidity for this 3 in 1 turning idea

Finishing tool is mounted on back of special follow rest.

LeBlond lathe owners often tell us about unusual ways they are able to use our machines. There's a reason. The rigidity, accuracy, weight—the unique features of LeBlond lathes encourage owners to expect a little more of them. With LeBlonds they confidently develop turning techniques that they just couldn't expect an ordinary lathe to handle.

Take this pipe roll "skinning" job at Beloit Eastern Corporation, Downingtown, Pa. These 23′ extruded wrought steel pipe rolls must mate perfectly in high-speed paper making machinery. This calls for straight and true machining accurate to .002 end to end—in itself, a stringent test of lathe rigidity.

But Beloit Eastern had to "skin" costs, too. So they took advantage of LeBlond's unique tailstock design with their unusual 3 in 1 turning idea. Now rolls are roughed, finished and polished all in *one* operation:

1. **ROUGHING**—Carbide tool is mounted on the compound.
2. **FINISHING**—A special solid ring-type follow rest (bolted to the carriage wings) carries a tool block and high-speed finishing tool.
3. **POLISHING**—A wooden emery paper holder made like a clamp is tied together against the turning pressure of the roll.

Spindle rigidity of the LeBlond tailstock, when greatly extended, actually makes this cost-saving method possible, since room must be made for follow rest at beginning of cut. The tailstock spindle even when extended, has full-length support thanks to exclusive LeBlond Thrust Lock design.

Ask any LeBlond lathe owner. He'll tell you he likes LeBlonds because he can count on them—for more rigidity, more usable power, more years of dependable, accurate turning. After all, isn't that what *you* want in a lathe? Today, get all the details on the complete LeBlond line of heavy duty turning machines, the most dependable lathes in the world. Call your LeBlond Distributor or write. *Ask for Bulletins HD-156 (25″) and HD-165 (32″).*

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Photos courtesy of National Screw and Manufacturing Company

"Controlled Dumping Results in Fewer Damaged Threaded Parts" . . . reports National Screw and Manufacturing Company's Cleveland Plant since their adoption of the new Powell tapered-nose box. The tapered-nose design permits better control of dumping with the result that product "rejects" have been materially reduced.

At National Screw this versatile open-end stacking unit doubles as working box or storage unit. In addition to minimum floor space requirements and excellent handling and stacking properties, the customer likes the tapered-nose design because it is easily handled by fork truck. In minimum head room areas it may be dumped by hoist.

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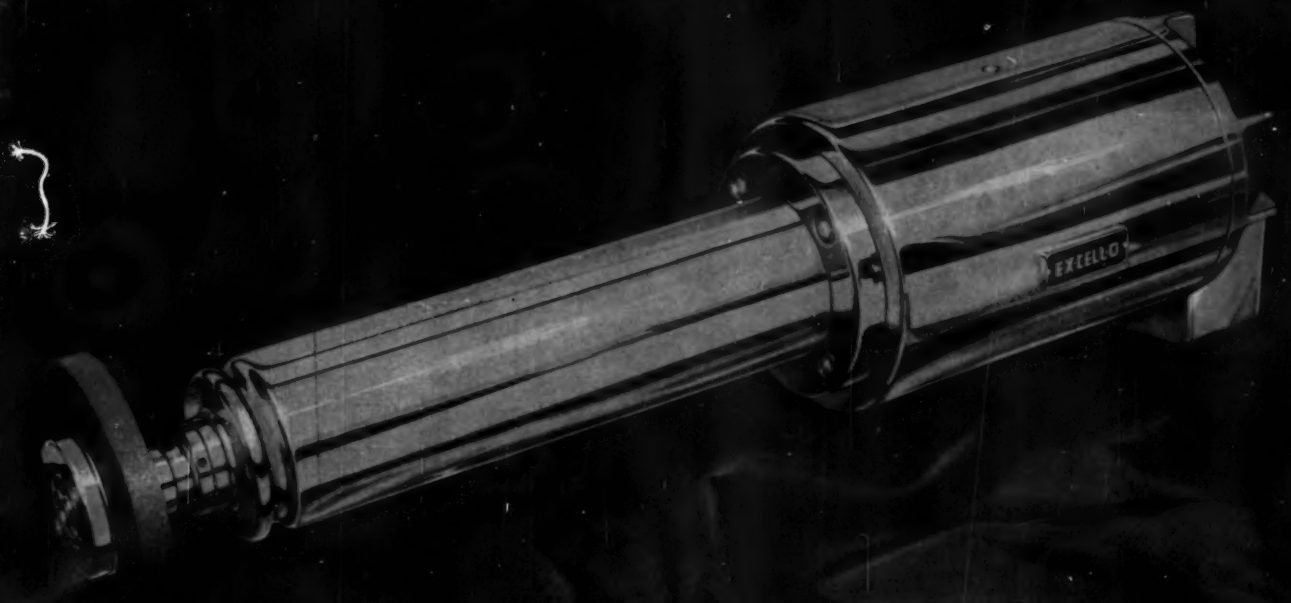

57-49

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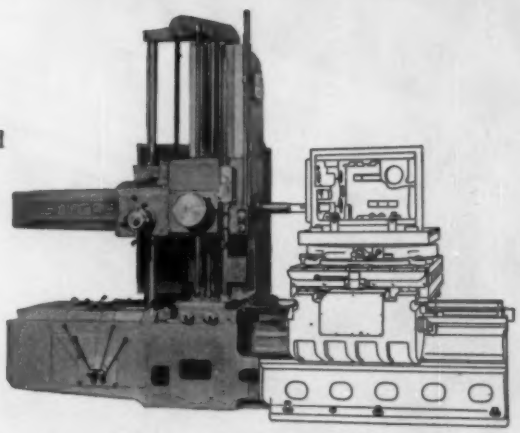

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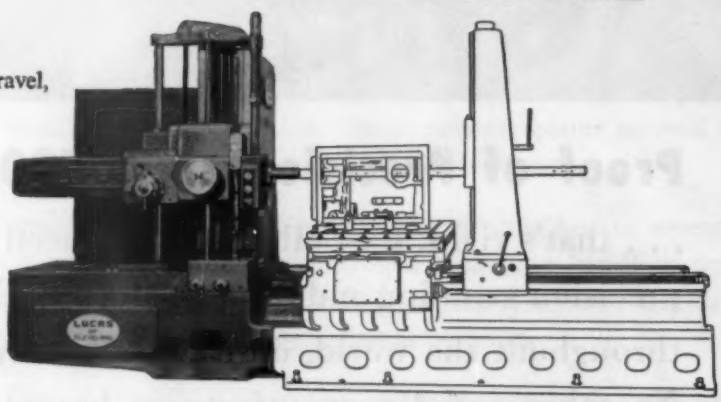

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in maintenance applications
or several, in combination

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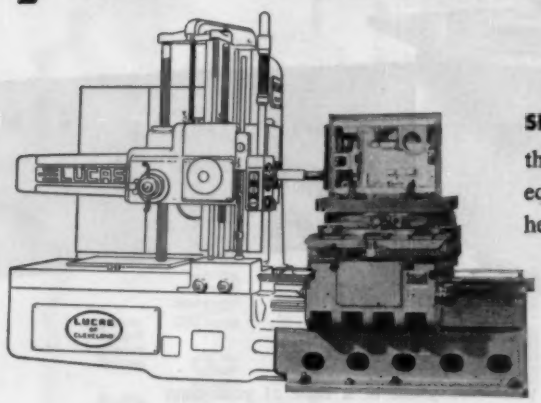

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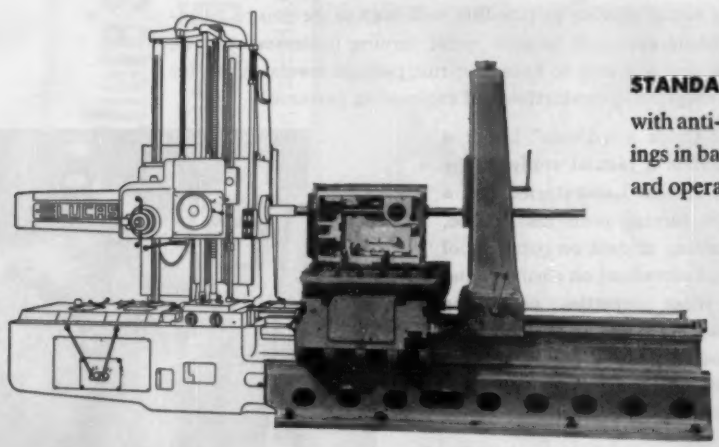

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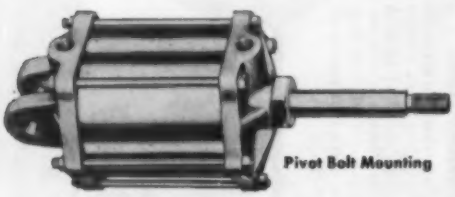

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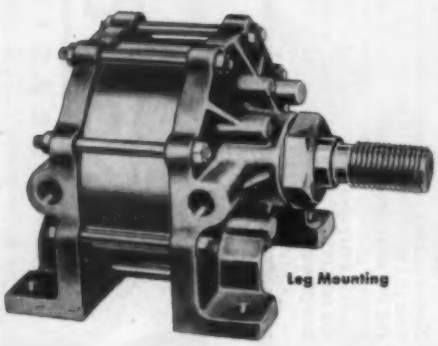

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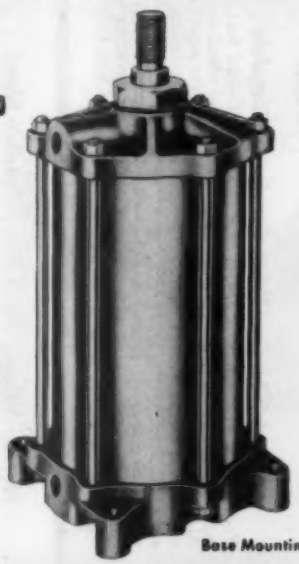

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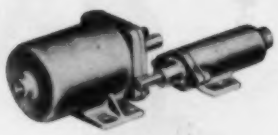

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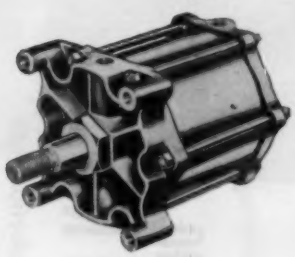

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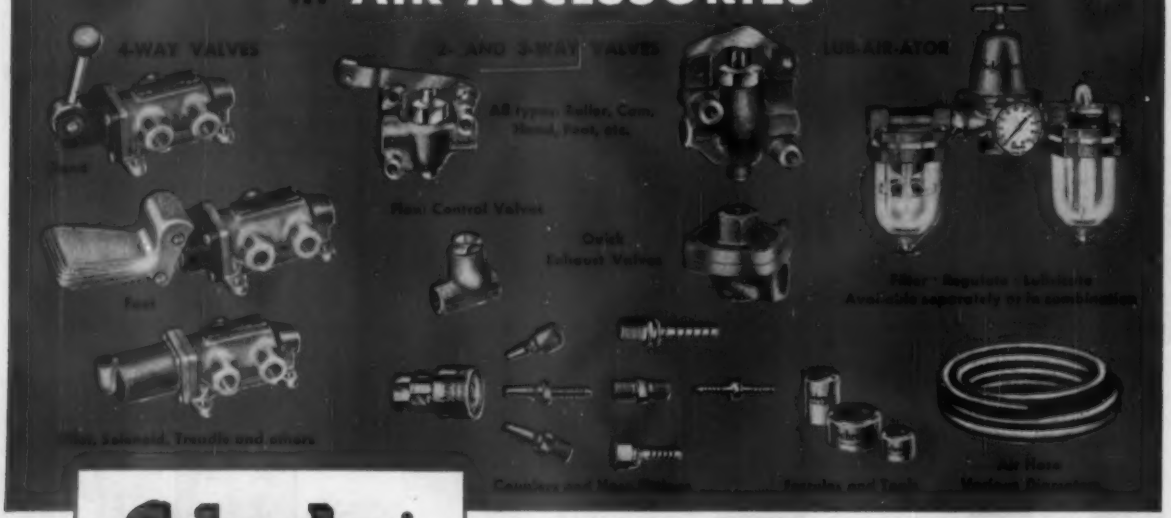

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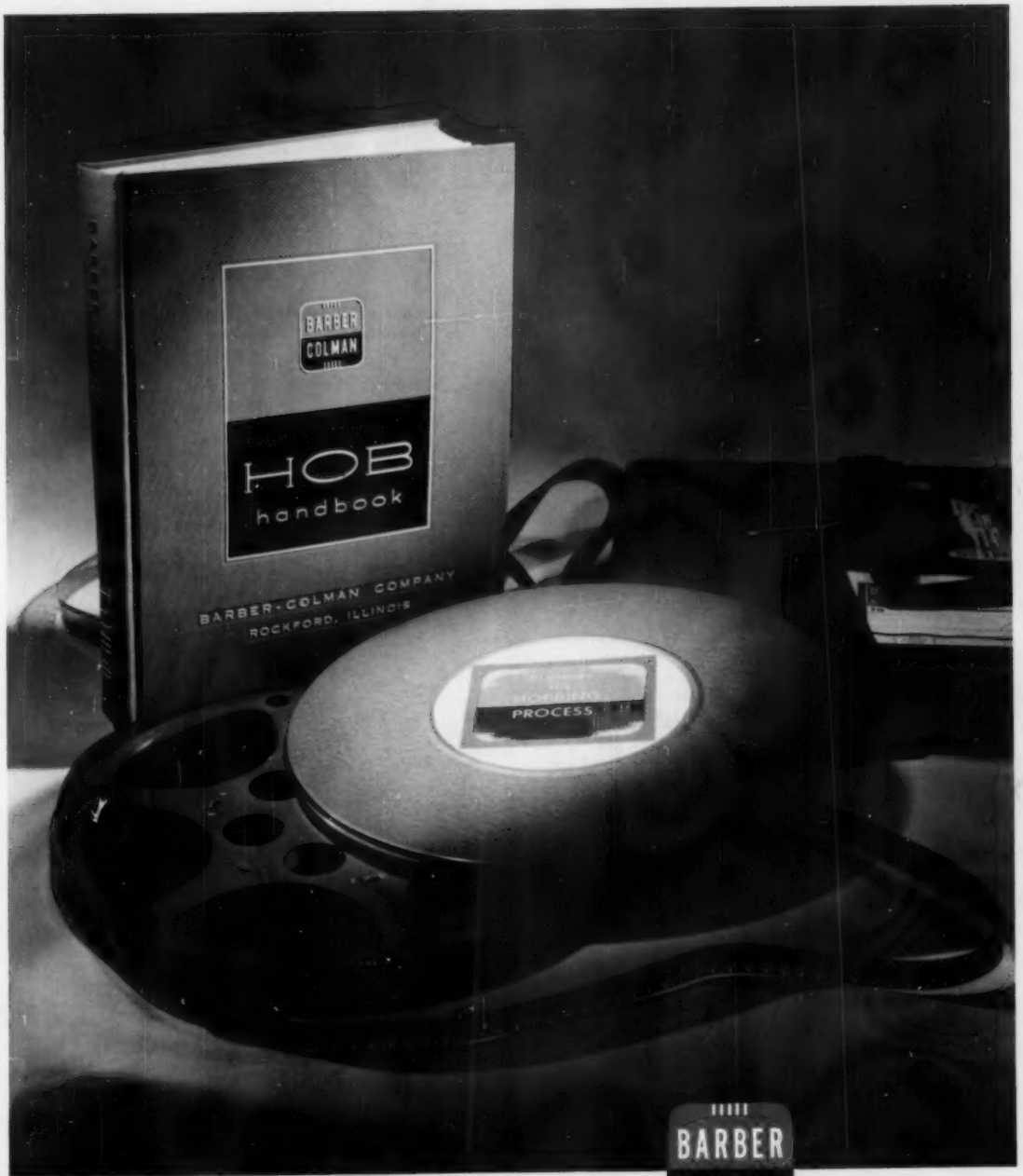

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HOB HANDBOOK

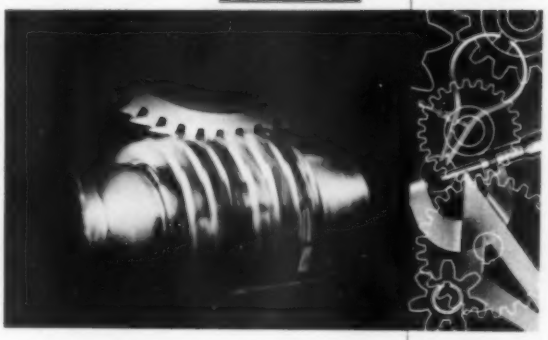
A complete technical reference book on the design, use and care of hobs and dimensioning and inspection of hobbed parts.

These sample pages from the Barber-Colman Hob Handbook, 1954 edition, indicate the type of technical information it contains. This book contains 388 pages of information describing all types of hobs and their standard sizes, tooth forms and dimensions. In addition, it provides standard formulas and dimensions for the hobbed part and describes inspection methods and tolerances for the part. Cutters which will cut the same type of parts as hobs, such as gear cutters and worm cutters, are described. Drawings and photographs illustrate the technical information.

The titles of the section headings are listed to indicate the scope of the book. Some of the types

section 3

gear hobs and cutters



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SEMI-FINISHING GEAR HOBS 67
ROUGHING GEAR HOBS 72
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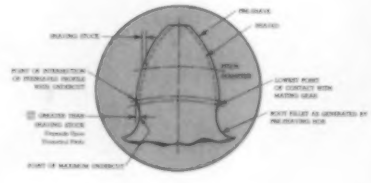

Figure 22. Comparison between hobbed and shaved profiles.

shave hobs. The protuberances commence undercut at the bottom of the gear teeth to provide clearance for the shaving cutter and to prevent the formation of an abrupt change in profile with its resulting stress concentration. With small numbers of teeth, the tooth form cut with a hob without protuberance is often undercut enough, but a protuberance is required for larger numbers of teeth to eliminate contact between the tip of the shaving cutter and the fillet on the gear teeth. Ordinarily, the undercut should be from .0005" to .001" more than the amount of stock left for shaving. Also, as shown in Figure 22, the intersection of the shaved profile with the undercut fillet curve should always fall below the lowest point of contact with the mating gear.

For a given pitch, the table indicates a fixed amount of protuberance for a range of teeth. Consequently, the amount of undercut will be greater on the smaller numbers of teeth in the range. When a definite amount of undercut is desired, the hob should be designed for the specific number of teeth in the gear. With a given protuberance, the point of intersection of the undercut with the involute form varies with the number of teeth. To insure that this point of intersection does not fall outside the true involute form circle, the true involute form diameter should always be designated on the gear print. The restrictions imposed by the true involute form diameter often require a special protuberance.

BARBER-COLMAN COMPANY

Since a number of gear grinding methods are in use, the form of pre-cut hobs is designed special for each application. The desired hobbed profile or the method of grinding should be indicated on the part print. Compared to the corresponding pre-shave hob form, tooth thickness is less because the amount of stock for grinding exceeds the amount for shaving. When a protuberance is required, it is greater than on pre-shave hobs.

Another modification of the hob tooth form is required on semi-finishing hobs if the gear teeth are to be chamfered. The chamfer on the gear teeth should be cut by the hob, not by the finishing tool. This requires the design of a ramp on the hob teeth which will produce the desired chamfer. This chamfer will change as the number of teeth or hobs angle varies. The hob designer must know the number of teeth, the hobs angle and the size and angle of the chamfer in order to design the semi-topping hob accurately. One of the primary reasons for adding chamfer to gear teeth is to protect the tips against nicks when large quantities of gears are handled. Since so many semi-finished gears are made on a mass production basis, for use of a protective chamfer is often desirable. In addition, this chamfer reduces the size of the burr or, in any case, the effect of this burr.

Other special modifications are frequently submitted to our Engineering Department. It is on these special applications that our Hob Engineers can be of outstanding service. You are invited to submit your gear hobbing problems to Barber-Colman for a thorough analysis.

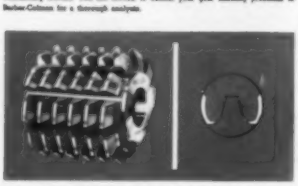

Figure 23. Semi-topping hob to provide chamfer on gear teeth.

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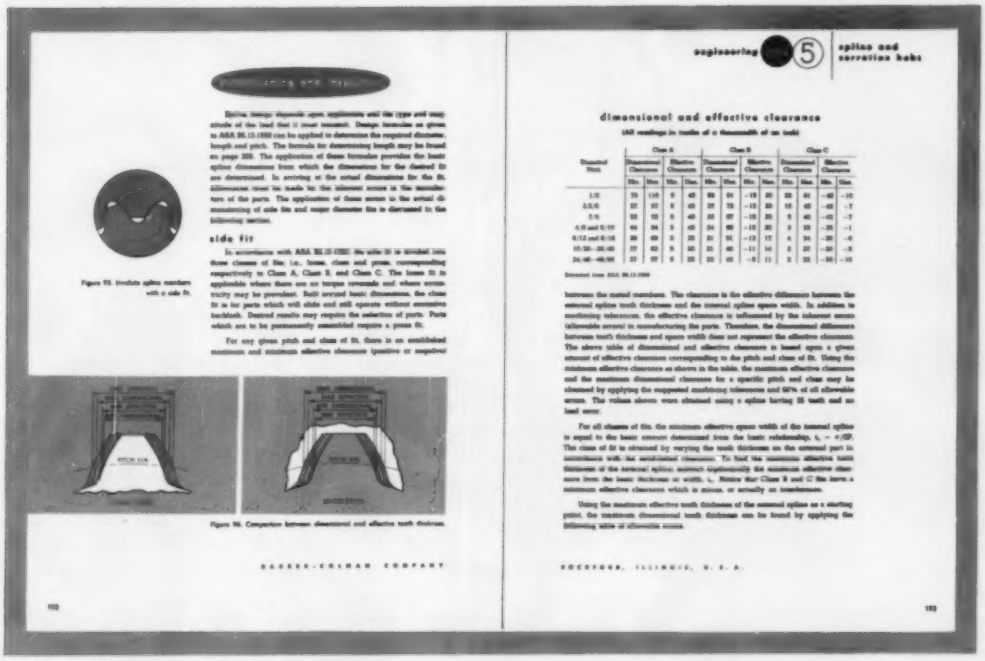
of hobs in addition to those shown in the table of contents include finishing hobs, semi-finishing hobs, roughing hobs, multiple-thread hobs, carbide-tipped hobs, involute spline hobs, parallel key spline hobs, tapered spline and serration hobs, and single-position hobs.

The last three sections provide information about the care and use of hobs and general engineering data. Some of the subjects include locating the hob, shifting the hob, hob wear, hob feeds and speeds, hob sharpening and inspection, involute functions, plotting involute tooth profiles, calculating test diameters, estimating hobbing time, bore standards, and arbor standards.

Contents

How Hobs Are Made
The Hobbing Process
Design Elements of Hobs
Gear Hobs and Cutters
Fine-Pitch Gear Hobs
Spline and Serration Hobs and Cutters
Worm and Worm Gear Hobs and Cutters
Sprocket Hobs and Cutters
Special Hobs
Proper Use of Hobs
Hob Inspection and Sharpening
General Engineering Data



engineering 5 spline and serration hobs

Figure 95. Involute spline meshes with a side fit.

side fit

Figure 96. Comparison between dimensional and effective tooth thickness.

dimensional and effective clearance

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How to Order Your Copy

METHODS AND PROCESS ENGINEERS: This book is available free of charge for those who actually specify hobs—methods, process and tool engineers, works managers, master mechanics, purchasing agents, superintendents and foremen who are directly concerned with hobbing. Write for your copy on your company letterhead giving your title and position and the make and model of your hobbing machines. Only such requests from qualified persons can be honored for a free copy.

NOTE: This is the 1954 edition; so please check to see if you already have a copy.

PROFESSORS AND TEACHERS: This book is an excellent reference for professors of mechanical engineering when hobbing is one of the subjects. A free copy of the book is available to professors and teachers for reference purposes but not for distribution to students.

GEAR DESIGNERS AND INSPECTORS: Order Part 1 of the book. This is a bound section which includes all the information about the design and inspection of the hobbed parts, but it does not contain data about the hobs.

HOBBING, SHARPENING SUPERVISORS: Order Part 2 of the book. It is a bound book containing the last three sections — Proper Use of Hobs, Hob Inspection and Sharpening, and General Engineering Data.

OPERATORS, STUDENTS AND OTHERS: Because of the high cost of this book, we must reserve the right to send a free copy *only* to those who qualify. If you do not qualify for a free copy, you may obtain one for the nominal price of $3.00. Please send your remittance with your order since we will be unable to send you an invoice.

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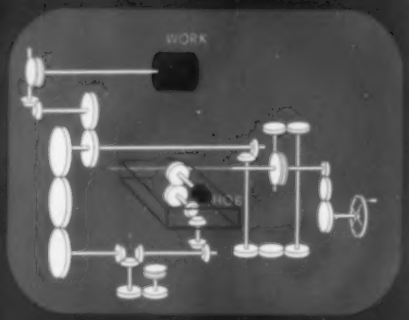

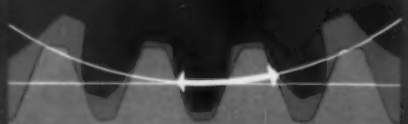

request a showing of this film

"the HOBBING PROCESS"

"The Hobbing Process" is a training film designed to be shown to those who need training in the basic principles of hobbing. It could be shown to hobbing machine operators, other hobbing department personnel, gear designers and methods and tool engineers who require basic information. We will arrange showings for mechanical engineering classes in colleges and universities. This film has also proved successful for meetings of technical societies, in which case we will be pleased to send an engineer to discuss other aspects of hobbing. The film is in full color with an an optical sound track. Running time is 22 minutes.

Following is a brief outline of the contents of the film:

Slow-motion sequence of the generating process.

Schematic drawings show basic relationships on a hobbing machine.

Generating fixture reveals how a hob tooth is generated from gear tooth form.

Animated drawings depict relationship between hob tooth form and gear tooth form.

Modifications on hob teeth are shown in relation to required modifications on gear teeth.

Colored hob and gear portray thread-tooth ratios with multiple-thread hobs.

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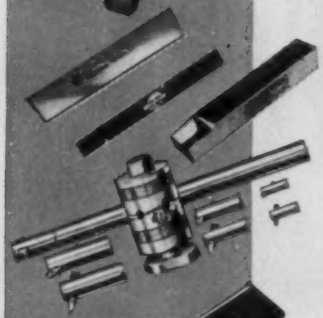
Quality TOOLS

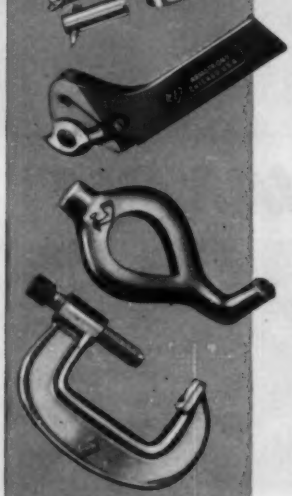
More than meets the eye

There are extra values in ARMSTRONG TOOLS that become apparent only with use.

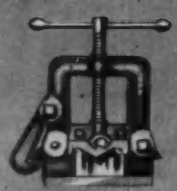
TOOL SENSE— convenience in use — the most efficient *"tool approach"* built into ARMSTRONG Tool Holders; the balance and *"feel"* of an ARMSTRONG Wrench; the *rigidity* of ARMSTRONG "C" Clamps; the extra *toughness* of ARMSTRONG Lathe Dogs and Eye Bolts; the universal *adaptability* of ARMSTRONG Set-up and Hold-down Tools — the evidence of "tool sense", the understanding of each tool's requirements.



STRENGTH — built into each individual ARMSTRONG TOOL is a safety factor of extra *strength* — *strength* beyond any need, the inherent strength of specially selected materials enhanced by proper heat treatment and hardening.



UNIFORM QUALITY — the uniform quality made possible by modern manufacturing methods, in a specially-built plant equipped with every needed quality control. The name ARMSTRONG with the Arm-and-Hammer Trade Mark is universally recognized as a guarantee of finest quality.



ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 WEST ARMSTRONG AVE. • CHICAGO 30, ILLINOIS

NIAGARA HAS THEM!

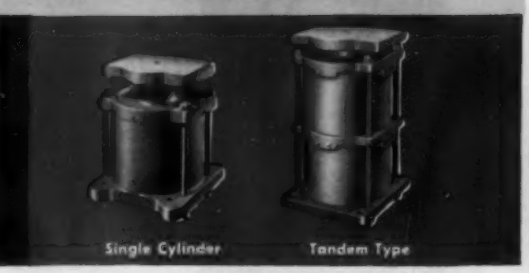
SERIES A, 5 ½ - 110 tons

SERIES AA, 32 - 200 tons

SERIES E, 75 - 200 tons
Front-to-Back Crankshaft

READILY EQUIPPED TO HANDLE

14 pt. Mechanical Sleeve — 18 pt. Electra-Pneumatic Sleeve — Electra-Pneumatic Friction



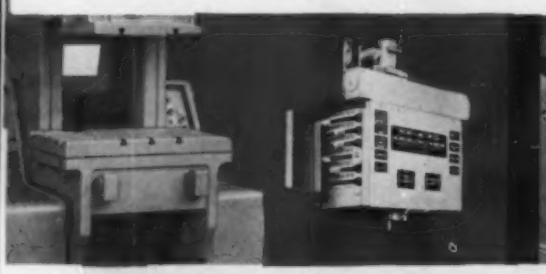
Single Cylinder — Tandem Type

THREE TYPES OF CLUTCHES

Each Niagara Inclinable features the clutch best suited for the purpose. (1) Famed Niagara multi-jaw mechanical sleeve clutch. (2) Exclusive Niagara multi-jaw Electro-Pneumatic sleeve clutch. (3) Niagara low inertia Electro-Pneumatic friction clutch.

FOUR TYPES OF DIE CUSHIONS

Designed and manufactured by Niagara, single cylinder and tandem type pneumatic die cushions are built in 4 types to make any Niagara Inclinable a double action press. Self-lubricating models are available for automated OBI's.



SPECIAL BOLSTER PLATES
J.I.C. CONTROLS — FLANGED SLIDES
POWER SLIDE ADJUSTMENT
FLYWHEEL BRAKE
DIE AREA LIGHTING
MOTOR CUTOUT SWITCH

EQUIPPED FOR AUTOMATION

Featuring the most advanced controls and devices, Series EA (automated models) are engineered for peak productive capacity. Here's a line of OBI's that is completely equipped by Niagara for operation in your automation lines.

POWER INCLINING DEVICE

Fast-acting, safe and easy to operate, Niagara's air motor inclining device (shown above) is furnished as an optional accessory.

WIDE CHOICE OF ACCESSORIES

With a full selection of modern press accessories available, Niagara Standard Inclinables are adaptable to the widest possible range of job assignments.

standard OBI presses in all sizes and types that are right for you!

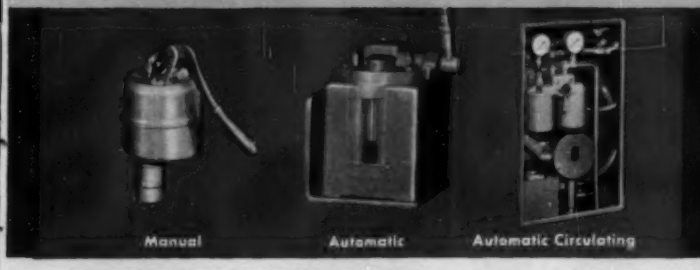
SERIES EA (Automated), 75-200 tons
Front-to-Back Crankshaft

SERIES BI, 60-200 tons
Double Crank

5 LINES . . . 34 MODELS
EACH A CHAMPION IN ITS CLASS:

Niagara offers you industry's most complete, most modern, and *most exclusive* selection of standard inclinables . . . *plus* an unequaled choice of press accessories and automatic devices to meet your specific job requirements. You can count on Niagara for inclinables that will do the most to speed production, assure accuracy, prolong die life and hold down maintenance costs within your plant.

YOUR WORK MOST PROFITABLY



Manual Automatic Automatic Circulating

CENTRALIZED LUBRICATION TO FIT THE NEED

Niagara Inclinables are readily equipped with either manually-operated or automatic lubricators, or automatic circulating oil systems. It's one of the many ways in which Niagara outfits standard inclinables to meet individualized requirements.

ALL TYPES OF AUTOMATIC FEEDS

To speed production, Niagara Inclinables are easily equipped with complete, automatic feed arrangements: single roll, double roll, dial, chute, magazine and specially engineered types. Variable speed drives can be provided to allow adjustment for the optimum speed consistent with the die, material and feed length.

NIAGARA

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

GET ALL OF THE FACTS on any or all Niagara Inclinable Presses. Consult with a Niagara representative. His recommendation will be impartial. He has all types of OBI's to offer. At your request, specific Bulletins on each series, containing complete information and specifications, will be mailed to you promptly

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES:

Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia

Distributors in principal U. S. cities and major foreign countries

Newest, most versatile, most complete

O. S. Walker, the originator of magnetic chucks, now offers a completely new, full line of chucks with the most permanent magnets ever produced — they're ceramic* — with many times the coercive force of alloy magnets. The face is *all* steel, with no soft insulating material. These chucks weigh only half as much as conventional permanent chucks, thus minimizing reciprocating table inertia.

Their low, low height gives more machine capacity than ever before. Fine pole divisions give maximum holding on all types of work pieces. All magnetic fields are neutralized to prevent magnetization of machine table or ways. *Write for details.*

*Patent applied for

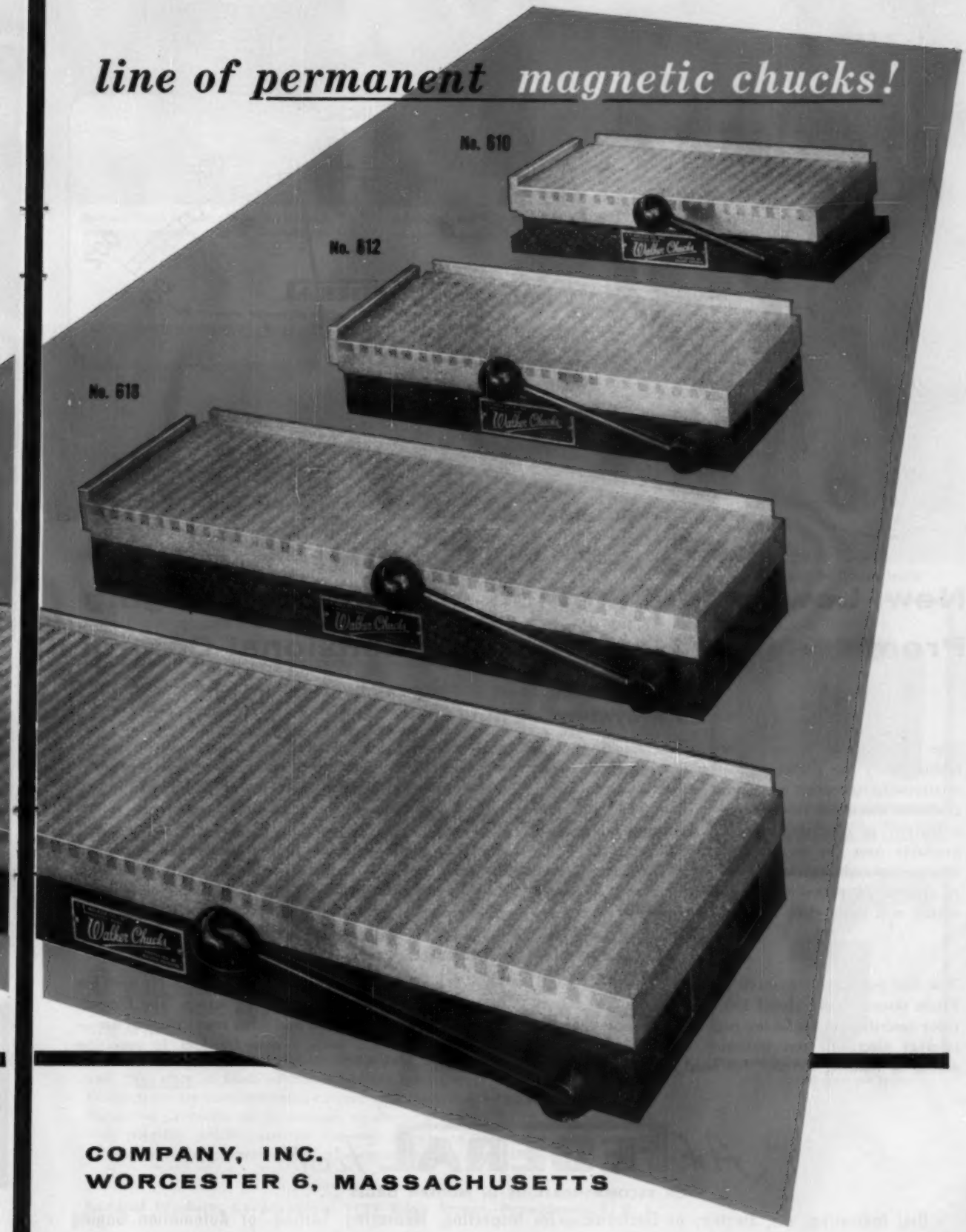
...perfect for milling too!

Exclusive construction† makes these new chucks perfect for milling or planing. Cutter is constantly *demagnetized* as it progresses — no more fouling of cutter and work with chips! Let us demonstrate this amazing contribution to industry.

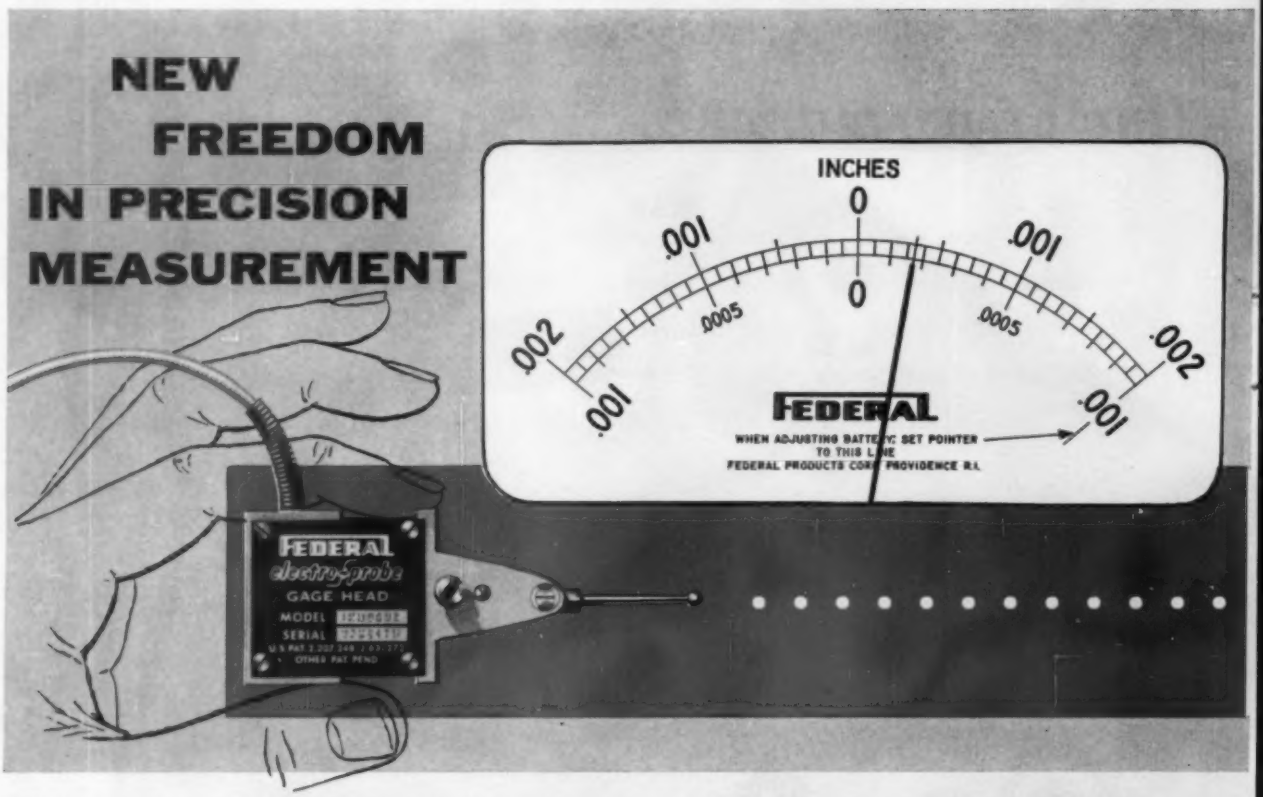
†O. S. Walker magnets are polarized horizontally (conventional construction has magnets polarized vertically).

O. S. WALKER

line of permanent magnetic chucks!



COMPANY, INC.
WORCESTER 6, MASSACHUSETTS



New, Lower Cost Method of Electronic Gaging Promises New Horizons in Dimensional Control

as a system of measurement

The Electro-Probe system is one of far reaching capabilities . . . the gaging signal maintains exact linear relationship to contact movement — so exact, in fact, that available electrical instruments have not had sufficient sensitivity to measure the error. And this precision is available over the exceptionally wide range of .060". Mechanical and electrical sensitivity of the Electro-Probe is capable of providing magnifications and accuracies which will more than meet even *tomorrow's* precision gaging requirements. Small size and extremely light gaging pressure enable the gage head to reach and explore hitherto inaccessible surfaces. Hermetic sealing also allows you to use the Electro-Probe under conditions where electronic gaging has previously been impractical. Thus, the Electro-Probe has a challenging reserve of capability awaiting the need and means for its use. Perhaps you have an application that needs the Electro-Probe's advantages. We'll be glad to discuss it with you.

as a precision instrument

The first publicly announced application of the Electro-Probe system is the Model 230 P-2 Electronic Test Indicator described on the facing page. It is far more than just another electronic test indicator. No need for special stands or holding fixtures. No need for external power. No voltage fluctuation or warm-up problems. No need for close gage head positioning during set-up. The Electro-Probe frees you from these and other restrictions of use — truly provides you with a new freedom in precision measurement.

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

Surface Plate — Electro-Probe can be used accurately with any type of conventional test set.

Bench — Use the Electro-Probe on any suitable comparator.

Machine — The light contact pressure of the Electro-Probe makes machine set-ups easier and faster.

..... the electro→probe

1. TAKE IT ANYWHERE — The Model 230 P-2 Electro-Probe, a part of the new Electro-Probe System, is a completely portable, self-contained unit consisting of a bantam size electronic gage head and transistor amplifier which together with metal carrying case and accessories weighs only 8½ lbs. It is completely independent of external power. Gage head and output cord are impervious to oil and water in any amount (electrical parts are hermetically sealed).

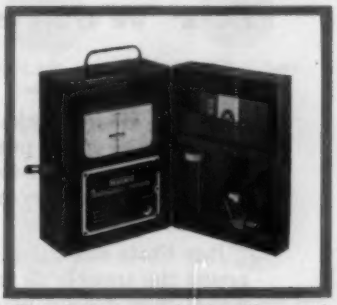
2. MOUNT IT ON ANY CONVENTIONAL FIXTURE — The Electro-Probe gages accurately without requiring a special stand or holding fixture because it has the lightest positive gaging pressure (less than 5 grams). Posts and arms which would deflect even under normally light gaging pressures remain rigid when the Electro-Probe is used. And unlike other precision instruments, gaging pressure is constant throughout range (change is less than 0.1 gram per .001").

3. SET IT UP IN A JIFFY — The Electro-Probe gives you precision *without* the penalty of time-consuming, finicky adjustments. Master it anywhere within its range because Electro-Probe response is absolutely linear. Full scale Zero Adjustment makes positioning easy and fast. Also — unlike any other electrical gaging device, warm up time is virtually zero. Gage the part when *you're* ready, turn it on and off, as you like, without penalty.

4. GAGE WITH EASE AND ASSURANCE — The Electro-Probe contact has friction-free travel of .060". It is clutch mounted so you can place head in almost any position — as well as to provide *complete* over-travel protection. Either of two magnifications instantly available by switching. Wide 4½" dial provides comfortably spaced, easy-to-read graduations. Knife-edged pointer permits sharply defined readings.

5. ENJOY GREATER RELIABILITY THAN EVER BEFORE — Use of printed circuits and transistors in Electro-Probe Amplifier means truly trouble-free operation. Connections are sure, operating current amazingly low, — no heating or voltage regulation problems, no dependence on electrical outlets. Learn more about this truly portable, reliable, accurate and versatile gaging device that gives you precision without the restrictions that precision has up to now imposed.

Packaged for Convenience

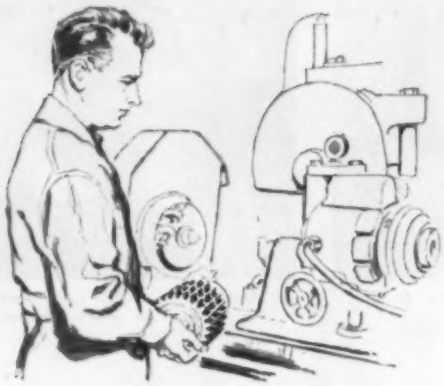


Electro-Probe gage head, self-powered amplifier, and accessories, all in one lightweight case.

. . . easily carried from job to job.

Write for literature

Federal Products Corporation, 7129 Eddy Street, Providence 1, R. I.



He upped crush-form grinding efficiency 500% for Western Gear Works

Western Gear Works, of Belmont, Cal., had the kind of trouble that could put a good production man on tranquilizers. In their crush-form grinding operation, so many gears had to be junked because of heat checks that total saleable production was only 9 good gears a day.

Bay State sales engineer Ben Guy was called in and diagnosed the trouble as soon as he got the specification of the wheel they'd been using. After making minor adjustments to the machine, he specified a Bay State wheel that ran cooler and cut cleaner. Result: production zoomed 500% to 45 good gears every 8 hours. Heat checks and loss of tolerance were totally eliminated.

Bay State representatives don't solve all their customers' problems as easily as this, of course, but the Western Gear story shows how important it is to have an abrasive man on tap who really knows his business. If you want careful, cost-conscious recommendations on your grinding problems, you'll find the Bay State man in your area has been thoroughly trained to give you that . . . and more.

Before joining Bay State ex-Marine Ben Guy learned trouble-shooting the hard way. He steers clear of guesswork, digs for facts and analyzes them to come up with answers that really work.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
Branch Offices and Warehouses: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities. Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario.

Completely Oil-Sealed!

A-B QUALITY

802TC Side Push Rod Type

802TF Rod Type

802TA Roller Lever Type

802TB Top Push Rod Type with Plastic Window

802TAO Roller Lever Type for Cavity Mounting

802TG Adjustable Roller Lever Type

SEALED HEAD KEEPS OUT OIL, COOLANT, METAL CHIPS ...your guarantee of reliable limit switch operation!

With *completely sealed* operating heads, as well as sealed switch bodies, Allen-Bradley Bulletin 802T oiltight limit switches provide maximum reliability in limit switch operation for your modern, high speed production machines. The sealed head excludes oil, dirt, and metal chips from the operating mechanism... the spring return, momentary contact operators cannot become sluggish and stick.

The maintenance free, double break, silver alloy contacts are sealed in the oiltight body. Interchangeable operating heads are available with various push rods and levers which can be mounted in any one of four positions. Oiltight transparent plastic covers, for inspecting contacts and wiring without removing the cover, are available for most units.

Here's a line of *quality* limit switches in which each type will provide millions of trouble free operations. Have your A-B control engineer acquaint you with this latest development—another advance in limit switch design.

ALLEN-BRADLEY
MOTOR CONTROL
Quality

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

9-57-MR

NOW... ALLEN-BRADLEY PRECISION-TYPE LIMIT SWITCHES ARE ALSO OILTIGHT!

OILTIGHT HEAD — Newly designed head on push type seals out oil. Roller lever types have sealed operating shafts.

OILTIGHT BODY — Synthetic rubber gasket between housing and plate excludes oil and coolant from operating mechanism.

Allen-Bradley precision-type limit switches combine very close operating tolerances with such a sturdy construction that they can be used for any industrial application. Now this line of limit switches has been further improved by making them completely oiltight.

Especially designed for use where the motion to operate the limit switch is measured in thousandths of an inch, these Allen-Bradley limit switches can henceforth be employed in applications where oils, coolants, and dust are present.

Allen-Bradley Bulletin 802 oiltight precision limit switches have a positive snap action mechanism which prevents any possibility of a "dead center" . . . no matter how slowly the actuating force is applied. They are available in both the spring return and maintained contact construction. And all have maintenance free, double break, silver alloy contacts.

Specify these Allen-Bradley oiltight limit switches where "precision" operation is required and where dirt and oil could cause trouble.

Push rod type. Plastic cover, for inspection without removing cover, made for most units.

Roller lever type limit switch with lever on right side. Also available with lever on left side.

Roller lever precision-type limit switch with roller lever in front of the switch body.

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

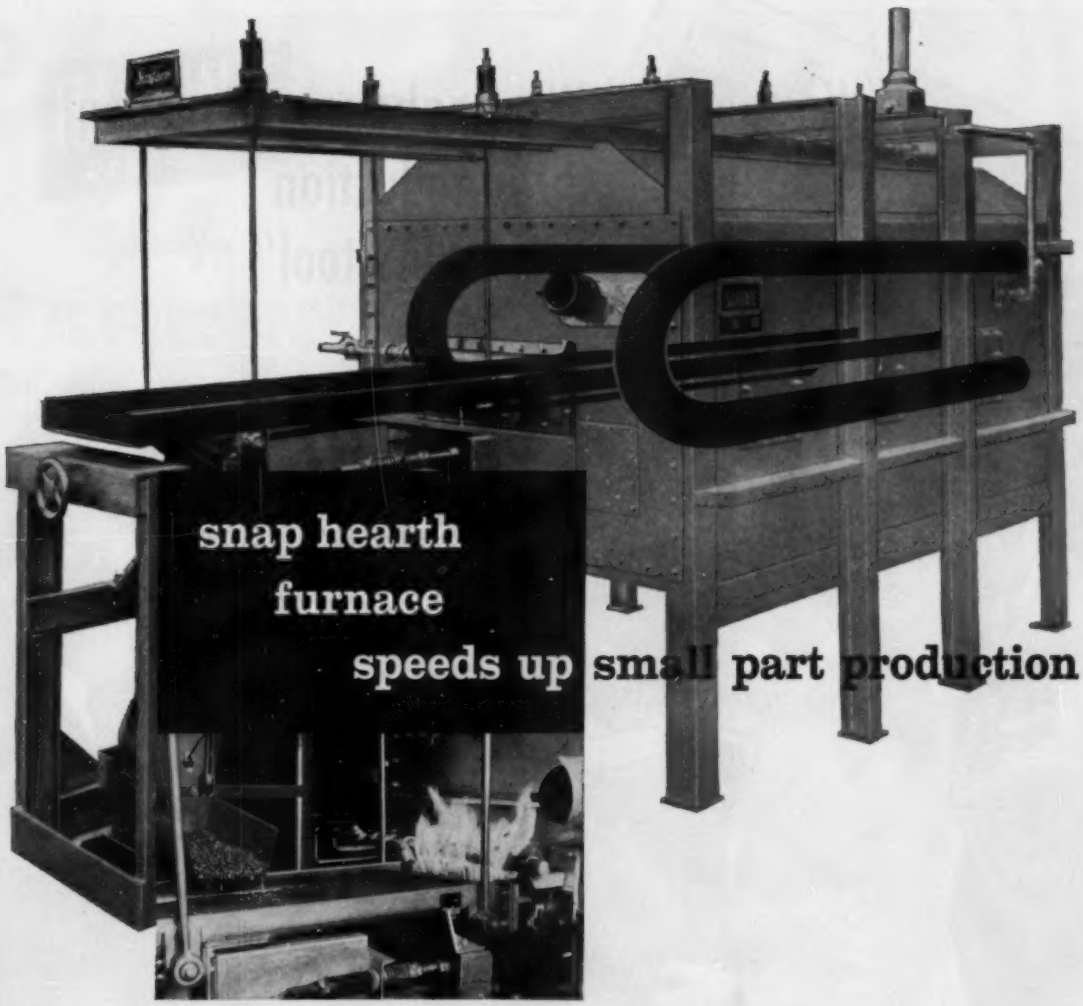
Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.
In Canada—
Allen-Bradley Canada Ltd., Galt, Ont.

ALSO—GENERAL PURPOSE LIMIT SWITCHES

Bulletin 801 general purpose limit switches in standard or heavy duty ratings. Maintained or momentary contacts with slow or snap action. Silver alloy contacts used throughout this line.

A-B QUALITY

9-57-MR



snap hearth furnace speeds up small part production

The quantity and quality of small parts can be increased by controlled atmosphere heating and quenching in this new Surface® Snap Hearth Furnace. Production rates up to 500 lbs/hr are attained in many plants.

This is the first suspended hearth furnace to use suction type radiant tube firing, which eliminates a muffle and its extensive replacement problems. Another important feature is the hearth, which snaps to move the parts a short distance at regulated intervals.

Combined with Surface atmosphere generating equipment, the Snap Hearth Furnace is especially efficient for clean hardening, dry cyaniding, carbon restoration.

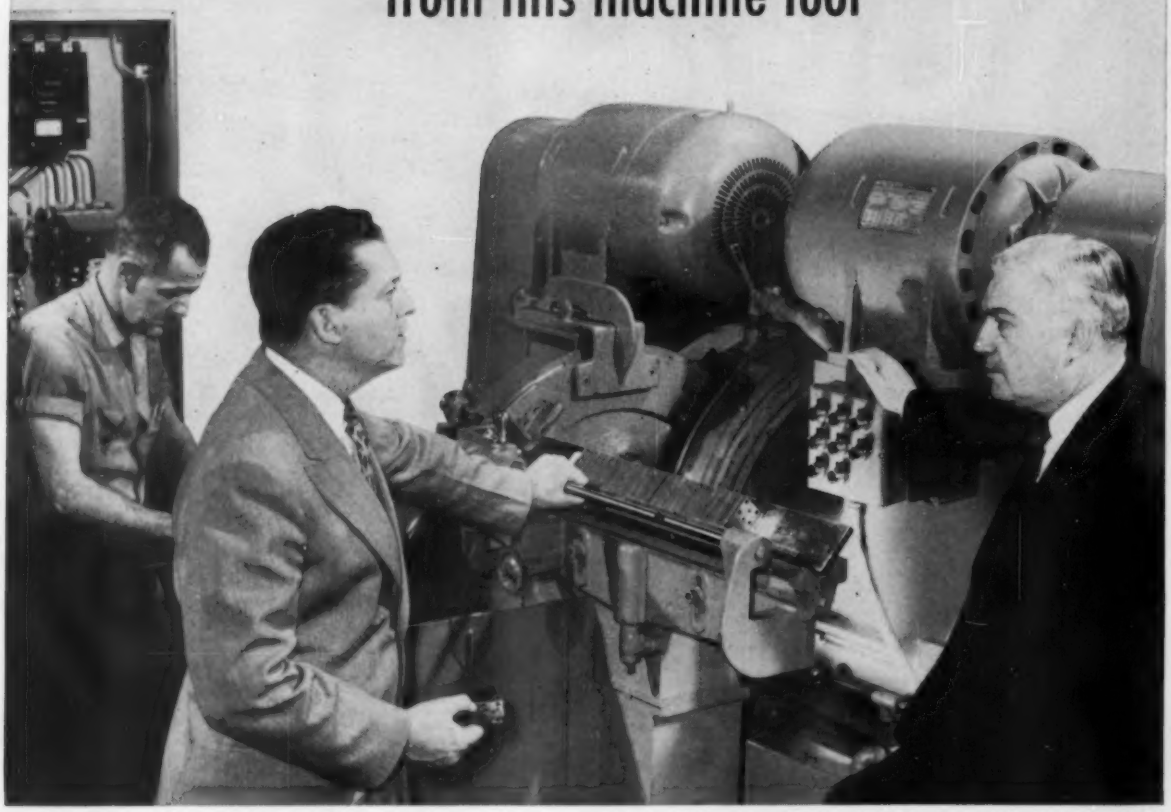
Write for Bulletin SC-173.

Surface Combustion Corp., 2365 Dorr St., Toledo 1, Ohio. In Canada: Surface Industrial Furnaces, Ltd., Toronto, Ontario.

wherever heat is used in industry

Surface®

"We specified Westinghouse components to get more production from this machine tool"



Trends to greater precision and higher operating speeds for machine-tools make components selection a critical decision.

Westinghouse components are built to deliver all the outstanding performance the machine-tool designer intended. Their long, dependable service life assures high machine-tool availability for accelerated, continuous production.

Westinghouse ability to understand, supply and service machine-tool needs is based on 40 years' firsthand experience in serving the machine-tool industry. Choose Westinghouse components to bring out the best in your machine tools. J-96107

Specify these Westinghouse components when you buy machine tools:

Motors • Controls • Pushbuttons • Gearmotors • Speed Reducers • Adjustable-Speed Drives • Semiconductors • Cypak* Static Control • Rectifiers • Magamp* Magnetic Amplifiers • Instruments • Relays • Machine-Tool Transformers • DYNAC® Magnetic Braking.

*Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse

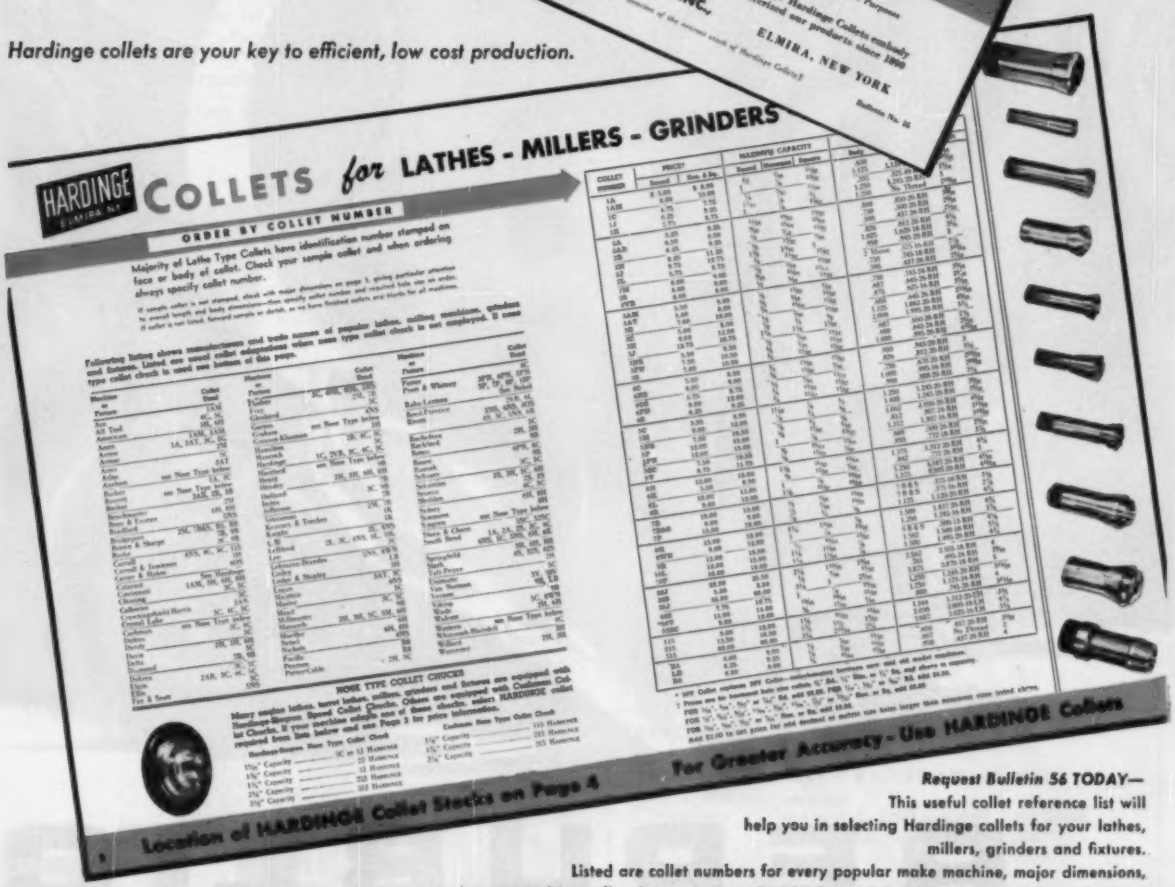
HARDINGE
ELMIRA, N.Y.

Specify

HARDINGE COLLETS

- * **ACCURACY**
- * **LONG LIFE**
- * **ECONOMICAL COST**
- * **STOCK DELIVERY**

Hardinge collets are your key to efficient, low cost production.


HARDINGE
COLLETS for LATHES - MILLERS - GRINDERS
ORDER BY COLLET NUMBER
Majority of Lathe Type Collets have identification number stamped on face or body of collet. Check your sample collet and when ordering always specify collet number.
NOSE TYPE COLLET CHUCKS
For Greater Accuracy - Use HARDINGE Collets
Location of HARDINGE Collet Stocks on Page 4

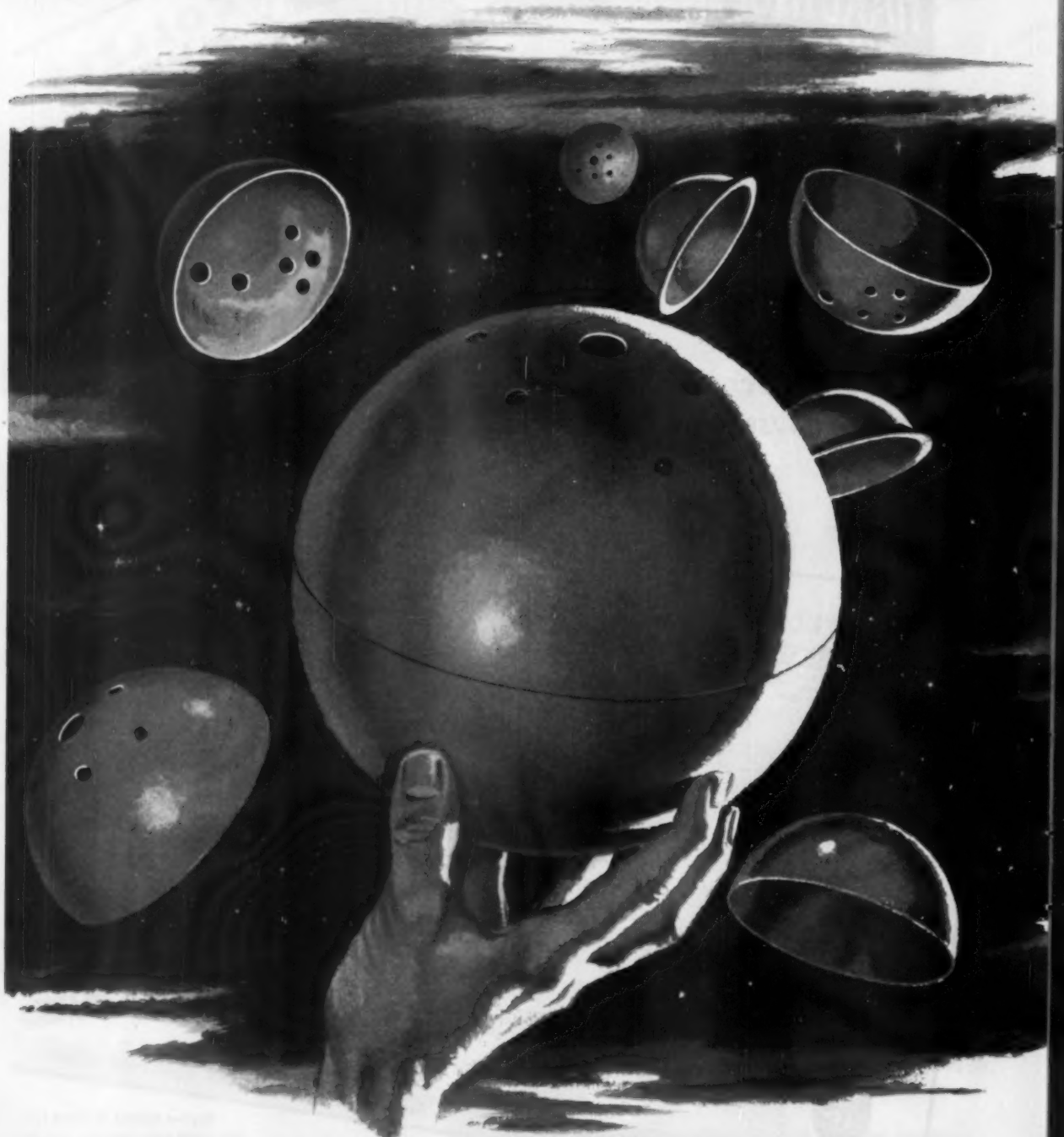
Request Bulletin 56 TODAY—
This useful collet reference list will help you in selecting Hardinge collets for your lathes, millers, grinders and fixtures.
Listed are collet numbers for every popular make machine, major dimensions, maximum capacities, collets for nose type collet chucks, stock locations, how to order and prices.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Immediate stock delivery from Atlanta, Boston, Chicago, Dayton, Detroit, Elmira, Hartford, Los Angeles, Minneapolis, New York, Oakland, Philadelphia, St. Louis.

HEMISPHERES FABRICATED



REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

FROM REPUBLIC TITANIUM

Are Strong, Lightweight, Defy Corrosion at Temperatures Below –150° C.

The hemispheres are used in highly specialized aeronautical applications calling for high strength, light weight, and resistance to the severe corrosive action of liquified gases at super sub-zero temperatures.

To meet these requirements, Alloy Products Corporation, Waukesha, Wisconsin, utilizes three major advantages of Republic Titanium in fabricating the parts. (1) Titanium's lightweight advantage reduces weight without sacrifice of strength or safety. In fact, titanium offers the highest strength-to-weight ratio of construction metals. (2) This exceptional high-strength feature of titanium withstands burst pressures in excess of 2,000 lbs. p.s.i. (3) Titanium's extremely high corrosion-resistant properties defy the corrosive action to which the units are constantly exposed.

Alloy Products draws circular blanks of commercially pure Republic Titanium, Type RS-70, into hemispheres. The edges are trimmed and holes pierced for instrument and component part connections. Then an extruding operation is performed on the pierced holes. Finally, the hemispheres are welded together into one tough, strong, corrosion-resistant sphere.

The entire fabricating operation is performed without difficulty and with little change in procedure as compared to other materials of construction.

Does this application of Republic Titanium suggest an idea for your product that needs to be strong, lightweight and corrosion-resistant? Republic Metallurgists are ready to help you apply titanium's advantages now. There's no obligation. Mail the coupon today for more information.

STRONG, LONG-LASTING DRIVE GEARS made from Republic Cold Finished Alloy Steel meet heavy-duty service requirements in this Black & Decker portable electric saw. These fine steels offer superior toughness and strength to withstand shock, stress, and fatigue. An exceptionally high strength-to-weight ratio permits design of thinner sections to save weight and hold down size without sacrifice of needed strength. The added advantage of cold drawing provides a bright, smooth finish, accurate size, cross-section, and straightness, plus superior ultimate strength, yield point, hardness and machinability. Our metallurgists and machining specialists will help you apply these fine steels to your product efficiently and economically. Write.

NEW FABRICATING PROCESS Republic Die-Form, can save you 1 out of 3 tons of steel. The automotive transmission shaft, shown above, proves this point. Using Die-Form, 200 tons of cold finished blanks produced parts formerly requiring 300 tons. Die-Form is a new method of cold forming hot rolled carbon, alloy or stainless steel bars into multi-diameter bars ready for final finishing. It permits major savings in time, material, and money in mass produced, multi-diameter machine shafts. Since Die-Form closely approximates the final part, only finishing cuts and/or grinding are required for completion. Scrap loss is minimized—production rate increased. Republic Booklet ADV-746 describes the capacities and limitations of this amazing new process. Send coupon for your copy.

REPUBLIC STEEL CORPORATION
DEPT. C-3819-A
3102 EAST 45th STREET • CLEVELAND 27, OHIO

Send more information on:
☐ Titanium ☐ Die-Form ☐ Cold Finished Alloy Steels
☐ Titanium ☐ Alloy ☐ Have a metallurgist call.

Name_____ Title_____

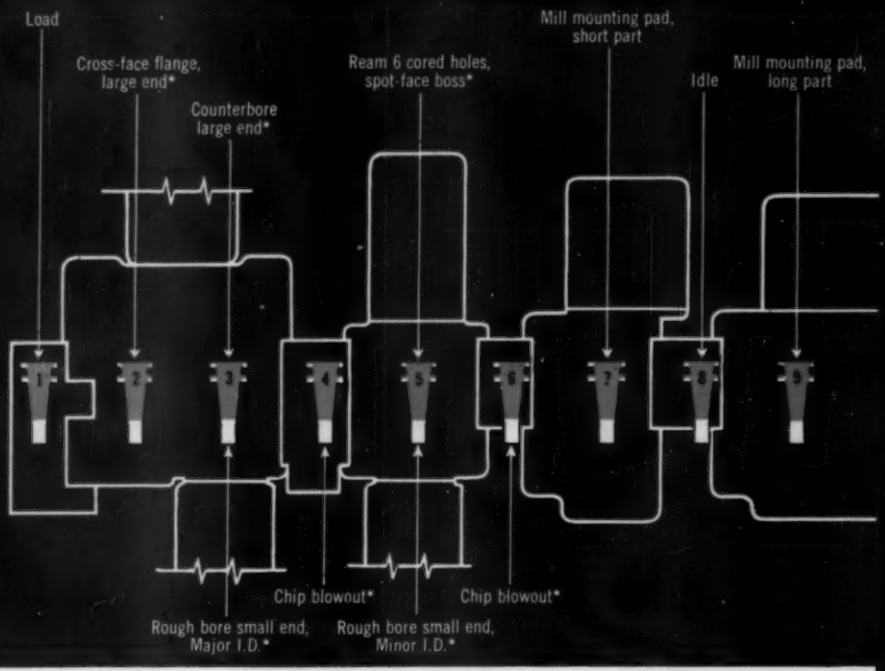
Company_____

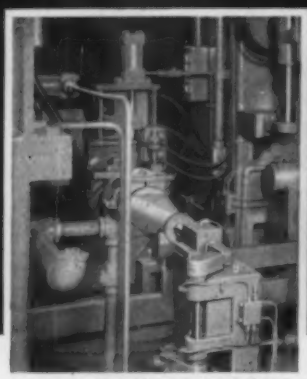
Address_____

City_____ Zone____ State____

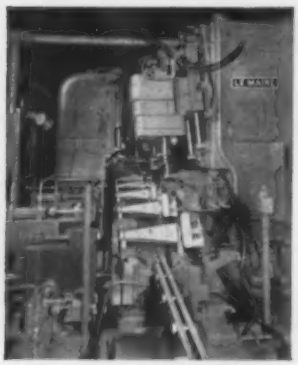
STEEL
and Steel Products

PRODUCING





Rotating station. Plate moves in, locates on part and trips limit switch, causing rotation for next operation.



Hardened pickup members hold part during transfer, locate it approximately prior to nesting in precision locators.

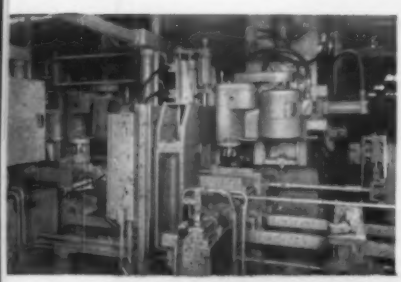
MACHINING TIME—20 SECONDS
CHANGEOVER TIME—ONE SECOND

This LeMaire 21-station transfer machine, installed by one of the automotive "Big Three," completely machines 180 aluminum transmission extensions per hour. It handles two different length parts . . . *and is changed over from one part length to the other with the one-second flip of a switch.*

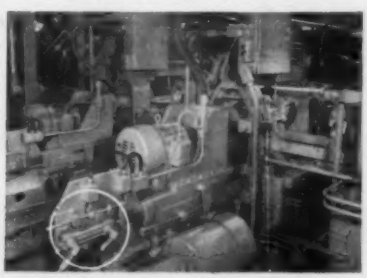
Most of the stations process both part lengths; others handle either the long or the short part exclusively. On the latter, parts which the station is not designed to process are passed automatically to the next operating station. Sensing devices, actuated by one selector switch on the main control panel, accomplish the changeover to machine different part lengths without manual adjustment of dog rails or limit switches, and without changing tool spacing, feeds or speeds.

Other features: • Walking beam transfer with hardened pickup members and precision hydraulic control • Unitized construction • Complete electrical interlock • Individual controls at each station • "PresTest" lights on main panel • LeMaire patented test panel in all control cabinets • Automatic lubrication • Electrical and hydraulic systems to J.I.C.

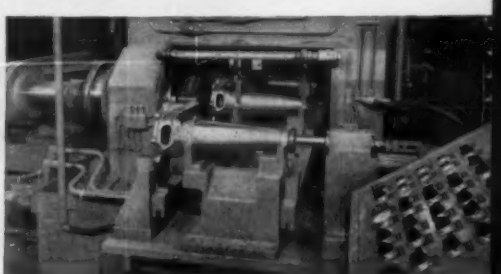
This is just one of many successful, *producing* installations designed, manufactured and tooled by LeMaire. Let us help with *your* production machining problems.



Station 7 (left) mills mounting pad on short part. For long parts, this station is automatically skipped for Station 9 (right).

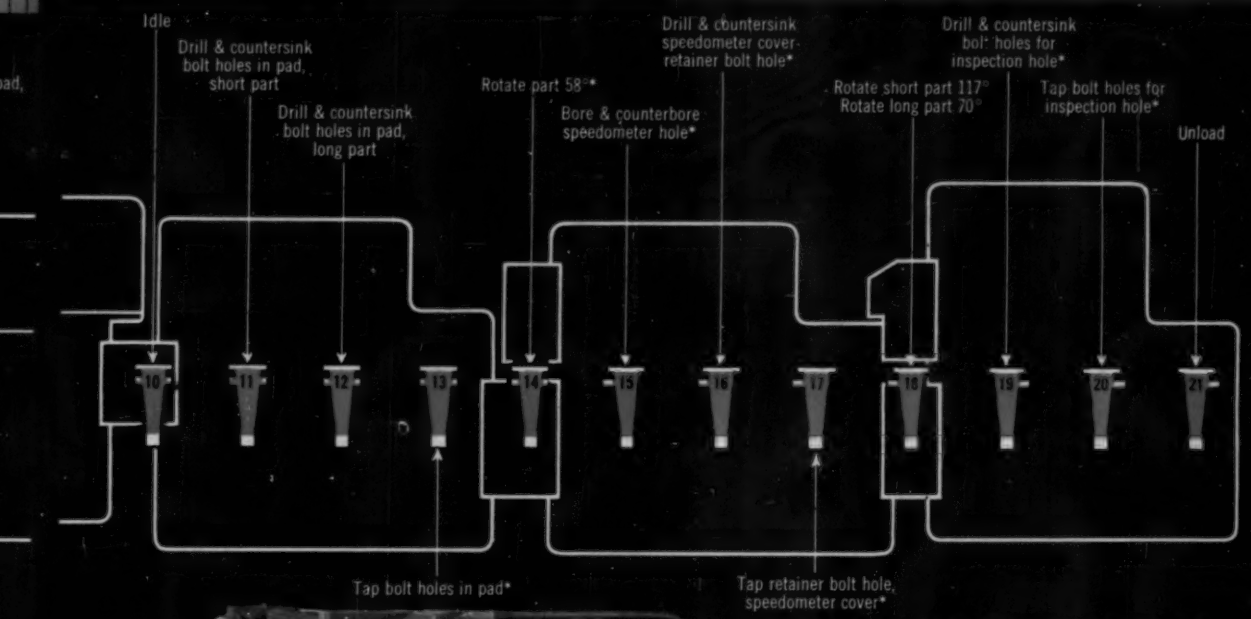


Note hydraulic cylinder which re-positions dog rail on hydraulic slide unit for part length change. Actuated by selector switch on main panel.

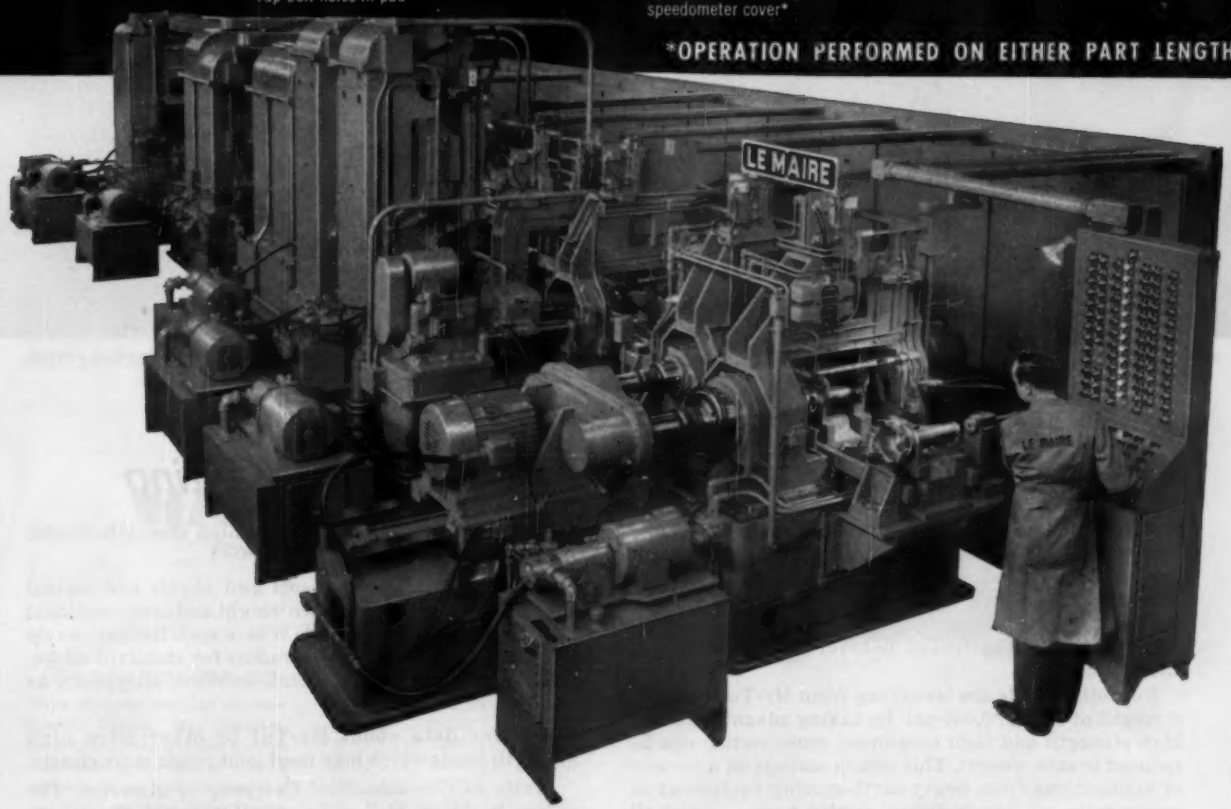


Load station. Placing part in half locators depresses limit switch, causing interlock. Pressing cycle-start button causes walking beam pickup and transfer to No. 2.

with LE MAIRE



*OPERATION PERFORMED ON EITHER PART LENGTH



LE MAIRE TOOL AND MANUFACTURING COMPANY

2657 SOUTH TELEGRAPH ROAD • DEARBORN, MICHIGAN

Designers and Builders of Special High-Production Machines

Navy A3D, largest carrier based jet aircraft

The hook's made of Hy-Tuf

designed to take exactly this kind of beating

In a split second, an arresting hook made of Crucible Hy-Tuf® stops a jet dead in its tracks. No other alloy can meet this particular aircraft's needs so well. And Hy-Tuf does it because it was developed by Crucible specifically for aircraft landing gear, hooks, and other such tough applications. Hy-Tuf is covered by AMS-6418B and MILS-7108.

Now other fields are benefiting from Hy-Tuf's tensile strength of over 230,000 psi. By taking advantage of its high strength and high toughness, cross section can be reduced to save weight. This means savings on a variety of applications from heavy-earth-moving equipment to power tools . . . power-driven garden tools . . . and all types of portable motors where a high strength-weight ratio is important.

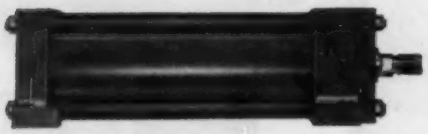
Furthermore, special *tools* and *shafts* are logical applications for Hy-Tuf when weight and cross-sectional dimensions must be limited. Where such limitations do not permit sufficient fillet or radius for standard alloys, a higher impact and less notch sensitive alloy, such as Hy-Tuf, is needed.

Ask for data about Hy-Tuf or other ultra high strength steels which may meet your needs more closely.

Write to Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



Five cylinder series... each the best of its kind!

Here you see one more reason why experienced cylinder users prefer Hannifin cylinders...there is a Hannifin cylinder series for every type of service.

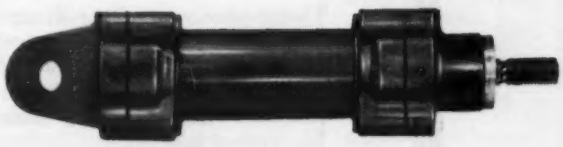
What pictures cannot show you is the extra effort that goes into every Hannifin cylinder, all the way from the drawing board to the shipping dock. This brings you design features other cylinders simply do not have...superior workmanship where it's most needed for long, trouble-free service...and better delivery promises, better kept. All at prices no higher than you may have been paying for less satisfactory cylinders.

There's a Hannifin man near you—or, if the need is urgent, call us long distance. He or we will welcome the opportunity to help you as you select the Hannifin cylinder series that best meets your needs.

AIR AND HYDRAULIC

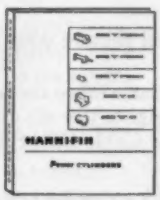
HANNIFIN

POWER CYLINDERS

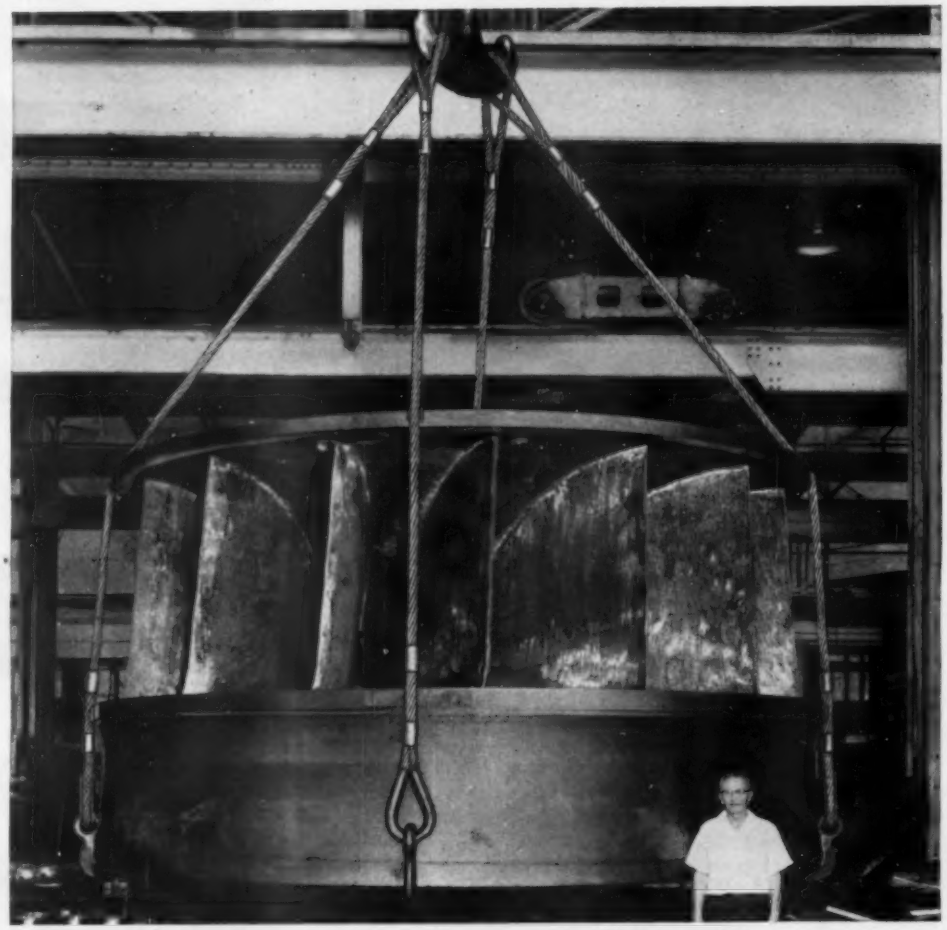


COMPLETE CYLINDER FILE

Write for your copy of this new Hannifin Cylinder File...complete, easy-to-use, easy-to-order-from information on five lines of Hannifin cylinders. Write Hannifin Corporation, 517 S. Wolf Road, Des Plaines, Illinois.



ACCO Registered® Wire Rope Slings



The safe balance between profit and loss

Every time a valuable load is lifted it swings in the balance between profit and loss on your books.

Dropping a valuable load could mean serious damage to the product or material being handled, to costly machines beneath the path of movement, and worst of all, it might result in personal injuries.

On the other hand, safe lifting avoids such losses and delivers the load according to cost accounting's pattern for profit.

That's why your rigger deserves the safest slings made. That means ACCO *Registered* Slings which are precision-made and pretested at twice working load before leaving the factory.

Remember, too, that only ACCO Slings offer DUALOC, the modern patented wire rope ending—safer, stronger, easier handled, longer life, proved in service.

Call your ACCO Wire Rope Sling distributor and protect your production line.

Valuable Information · Write our Wilkes-Barre office for **Folder DH-532** which gives authentic strengths and weights (for six different lifts) on a full size range of ACCO *Registered* Cable-Laid Slings.

WHAT "ACCO REGISTERED" MEANS

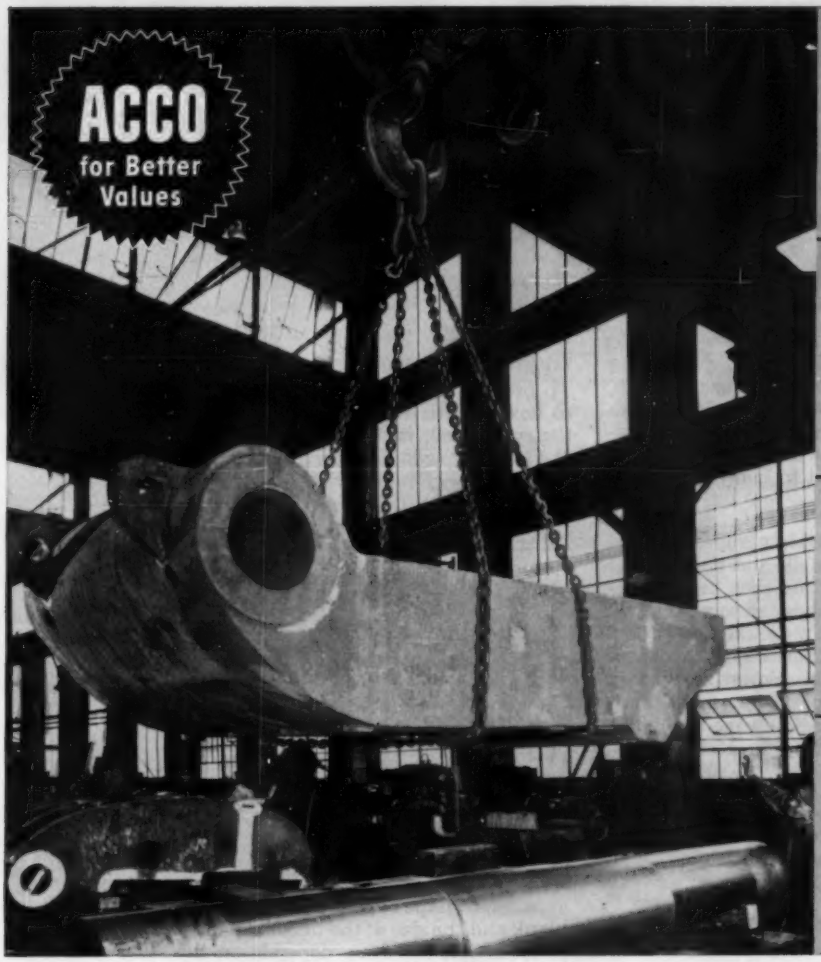
1. The best material
2. Unit safety factor (on bodies, rings, links, hooks)
3. Proof test of complete sling to twice the working load limit
4. Actual field service test of each design
5. Metal identification tag on each sling
6. Signed Registry Certificate with each sling

ACCO

AMERICAN CHAIN & CABLE COMPANY, INC., WILKES-BARRE, PA.

Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

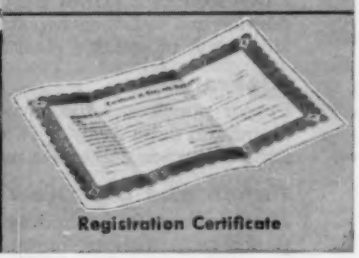
In Canada: Dominion Chain Company, Ltd., Niagara Falls, Ontario



Accoloy X-weld 125 Chain
Pat. No. 2763768

New Shaped Master Link

ACCO Registration Ring



Registration Certificate

Big, costly loads are safe with Acco Registered® Sling Chains

• Pictured above is a huge, 35,000-pound casting being lifted *easily and safely* by a 4-leg ACCO *Registered* Sling Chain. Directly beneath the load is a highly polished and machined crank shaft worth many thousands of dollars.

Imagine the cost in lost labor and materials, should the sling chain fail! But it won't fail—for this ACCO *Registered* Sling Chain and all its components have the inbuilt strength needed to handle the job with complete safety!

When you buy an ACCO *Registered* Sling Chain, you get these four exclusive "plus values" which *add materially to the worth, but not to the cost,* of the sling:

1 • **Accoloy X-weld 125 Chain**, for extra strength. This chain hangs straight . . . does not kink . . . has extra resistance to bending.

2 • **New Shaped Master Link**, uniquely shaped to withstand deformation under loads up to 18% greater than a round-section link can do.

3 • **ACCO Registration Ring**, serially numbered as evidence that the assembled sling has been factory proof-tested to twice its working load limit.

4 • **Registration Certificate**, signed by us, attesting to the field-tested design and proof-testing of the complete sling.

Remember, the best sling is one of your most economical material-handling tools. You'll find it good business to consult your ACCO *Registered* Sling Chain Distributor on all your sling needs; his counsel is available without obligation. If you don't know his name, write us at York, Pa.

WHAT "ACCO REGISTERED" MEANS

1 The best material
2 Unit safety factor (on bodies, rings, links, hooks)
3 Proof test of complete sling to twice the working load limit
4 Actual field service test of each design
5 Metal identification ring on each sling
6 Signed Registry Certificate with each sling

American Chain Division
AMERICAN CHAIN & CABLE
Bridgeport, Conn. • Factories: *York and *Braddock, Pa.

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, *New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco

*Indicates Warehouse Stocks

ACCO
TRADE MARK

Drawing Aluminum

requires
...no special skills
...no special equipment

Aluminum is a "natural" for drawing, for any metal working operation. It's light, easy to handle, and one of the most workable metals. It requires less power to draw, no special equipment. However, unless you've worked with aluminum there are certain things you'll want to know:

Draw Tools

For quantity production, use high grade tool steel for frictional surfaces such as die and blankholder faces. However, alloy cast iron dies and blankholders with fine surface finishes can sometimes be used. These surfaces, and draw die radii should be ground and polished in the direction of metal flow where possible. Punches and knockouts are usually a cast iron alloy. Draw die parts for smaller production can be low carbon steel, low melting point zinc alloys or suitable plastics.

Clearances

Proper punch and die clearances are needed so aluminum flows freely between tool surfaces. Too little clearance will cause metal fractures.

Punch and Die Draw Radii

Here's a formula for finding proper draw die and punch radii with aluminum alloys having shear strengths higher than yield strength:

Minimum Draw Die and Punch Radius = 4 x blank thickness.

With alloys having shear strengths lower than yield strength, increase the minimum radii proportionately. Draw die radii should not be more than 12 times metal thickness, especially for thicknesses up to .125 inch.

Blankholder Pressure

Tools should be designed so that blankholder pressure is adjustable, since each draw job requires careful setting of pressure. There must be just enough pressure to prevent excessive wrinkling.

Pressure, Energy

Tool and press requirements are based on the drawing pressure and energy that the job demands. These formulas will help you figure pressure and energy for drawing round shells from aluminum:

Tons drawing pressure =

$$\frac{3.1416 \times d \times t \times St \left(\frac{D}{d} - 0.7\right)}{2{,}000}$$

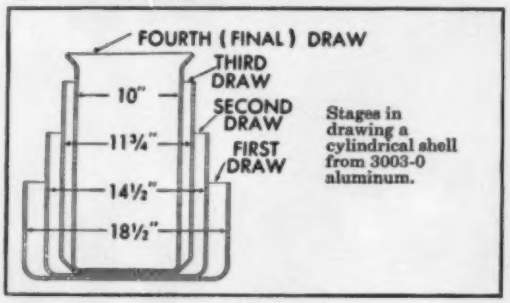
Inch-Tons drawing energy =

$$\frac{3.1416 \times d \times t \times St}{2{,}000} \times \left(.35 + \frac{D-d}{d}\right) \times (V \times 0.7)$$

d = drawn shell diameter in inches
t = thickness of material in inches
St = Tensile strength of material, lb./sq. in.
D = Initial diameter of blank or shell, inches
V = Working stroke, in inches

Drawing Speed

To prevent fractures, aluminum must have time to flow. Depth and shape of the drawing govern the ram speed; more ductile alloys can be drawn at greater speeds. Relatively deep drawn parts in ductile alloys should draw at a top ram speed of 100 ft. per min. Less ductile alloys may require a speed of only 30 ft. per min.



Stages in drawing a cylindrical shell from 3003-0 aluminum.

Blanks

The number of draws needed to produce a given aluminum shape depends on the dimensions of the blank and the size of the finished part; the amount of reduction per draw depends on the alloy and temper. Deep drawn shells needing several operations are usually made from "–O" temper (annealed) blanks. Tempered material, to a medium hardness, can be used for shells requiring more than one operation, but the hardest tempers are recommended only for single operations.

The above is typical of information in the Reynolds handbook, "Aluminum Forming". Single copies of this book are available without charge when requested on business letterhead. For immediate assistance on any phase of aluminum fabrication, call the nearby Reynolds office, listed under Aluminum in your classified phone directory. Or write *Reynolds Metals Company, P.O. Box 1800-JJ, Louisville 1, Kentucky.*

REYNOLDS ALUMINUM

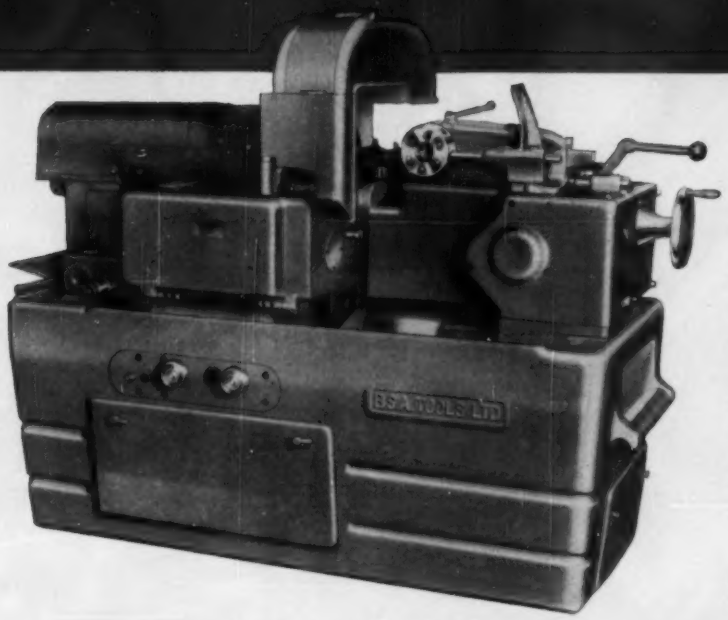
The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

Makers of Reynolds Wrap

Watch Reynolds All-Family Television Program "DISNEYLAND", ABC-TV.

BSA first to provide UNIT REPLACEMENT of parts subjected to most wear

to keep important production flowing with new machine performance



With speeds, machining accuracy, ease of tooling and operation and maintenance equal or superior to any machine in its classification, BSA Single Spindle Automatic Screw Machines offer a very definite plus value through *"unit construction and replacement"* of work spindles, side slides, turrets and gear boxes.

Unit construction, plus extremely rigid, one-piece machine frame makes it possible to bring BSA machines back to factory standards of perfection quickly. You place an important unit back in the line with a minimum of lost production.

Shipment of replacement parts are speeded to you from National Acme, in Cleveland. Here, also, full engineering and design services as well as demonstration and service facilities, in the National Acme tradition, are available to you.

May we explain how *"unit construction and replacement"* can ease your production problems?

Additional Production Advantages of BSA

FIVE STANDARD CAPACITIES: ½" ¾", 1", 1¼", and 2".

WIDE RANGE OF SPINDLE SPEEDS—200 to 6000 on ½" machine, 69 to 1260 on 2" model.

Cams, change gears and tooling easily accessible FOR QUICK JOB-TO-JOB CHANGEOVER.

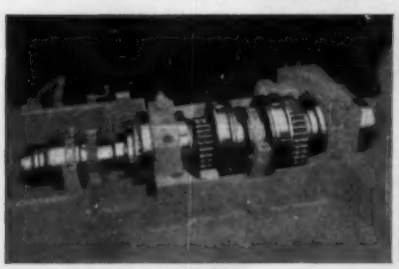
Unit construction provides quick access for EASY MAINTENANCE.

Special spindle mounting, DESIGNED TO REDUCE WEAR.

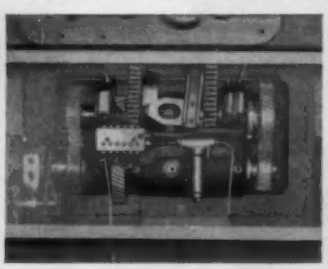
Positive chain drive from gear box to spindle PREVENTS SLIPPAGE.

All models use STANDARD AMERICAN TOOLING

UNIT CONSTRUCTION SPEEDS REMOVAL OR REPLACEMENT



Work Spindle



Gear Box

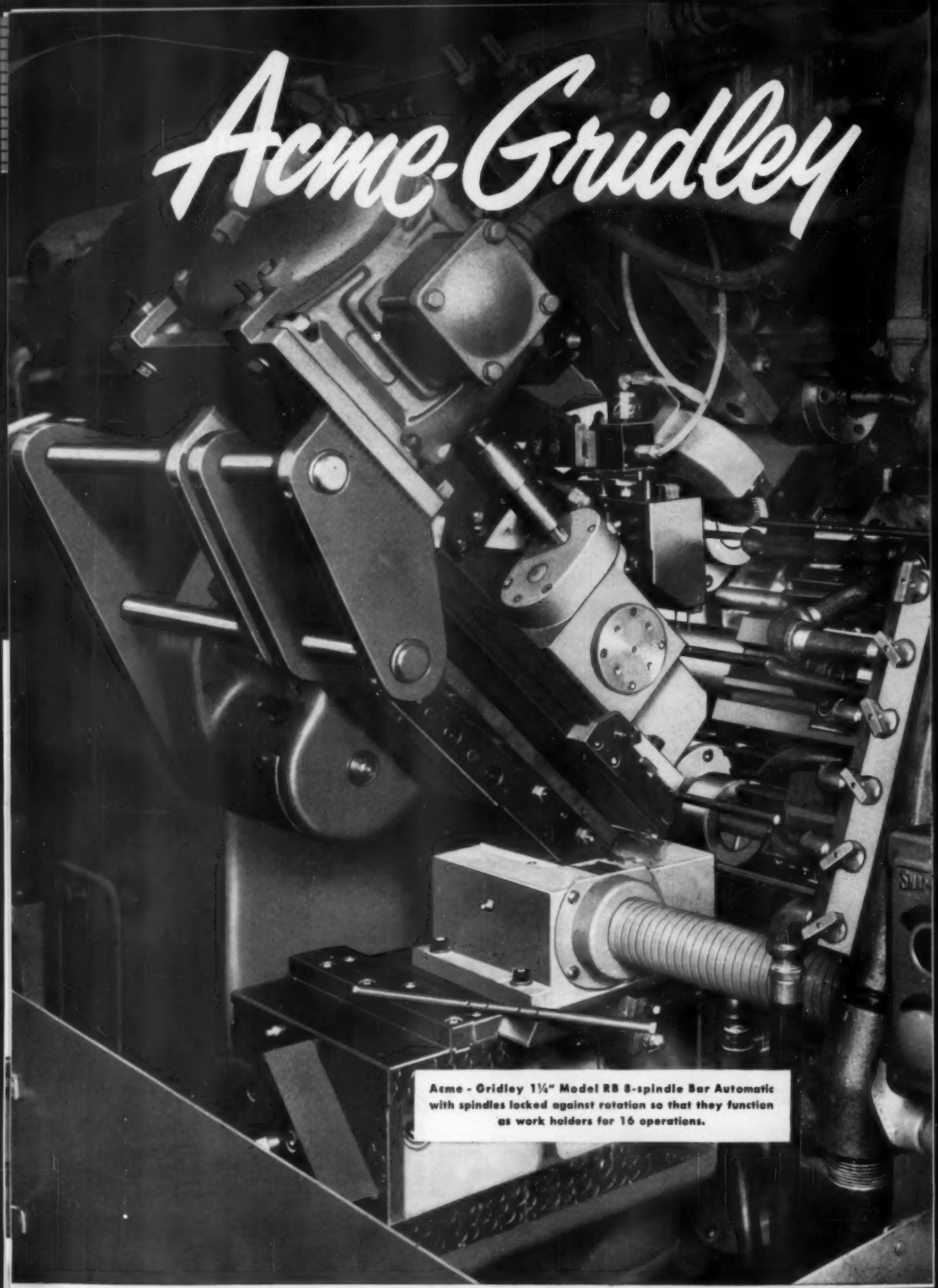
Side Slides and Turret

Distributed and Serviced in U.S.A. by...

National Acme

THE NATIONAL ACME COMPANY, 171 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

Acme-Gridley



Acme - Gridley 1¼" Model RB 8-spindle Bar Automatic with spindles locked against rotation so that they function as work holders for 16 operations.

—open . . . for business!

Since the primary advantage of a multiple-spindle automatic is to make it possible to complete more operations in a single setup, accessibility *to* and plenty of space *in* the tooling zone, *to apply the maximum number of tools*, is especially significant.

When you want to speed up production, perform unusual operations, or to get a finer finish, let a National Acme tooling engineer apply his COMPLETE LINE experience in helping you select the attachments to perform these operations on your machine.

Combination Cross Milling and Drilling Attachment

Worm or Thread Generating Device

Threading or Tapping Tool

LET US TELL YOU MORE ABOUT *Acme-Gridley* BASIC DESIGN

This is but one of many BASIC DESIGN features which are responsible for Acme-Gridley's outstanding performance records. May we send you additional information? Or, better yet, let us send a representative to discuss possible production short cuts with you.

National Acme

THE NATIONAL ACME COMPANY, 171 EAST 131ST STREET, CLEVELAND 8, OHIO

SALES OFFICES: • Newark, N. J. • Chicago, Ill. • Detroit, Mich.

Larry Cowan, President of the Lionel Corp., tells why:

"I put trains in the sky!"

"Boys hate waiting for trains, especially Lionel trains! So when a store orders, delivery has to be fast.

"It always is, when we ship our trains through the sky... by Air Express!

"No store in the country could possibly stock all the hundreds of different Lionel models. Air Express delivers for us anywhere in the 48 states – inside of a day!

"Sometimes, too, we depend on Air Express because of sudden, unpredictable rushes for certain models. Our production facilities are taxed to the utmost. But we gain time for production by shipping Air Express.

"With its speedy pick-up and delivery by radio-controlled trucks and its nation-wide private wire system for spotting shipments, Air Express gives us service that's second to none!

"Yet, we save money by specifying Air Express. For instance, a 15-pound shipment from Newark, N. J. to Atlanta, Ga. costs $5.63. That's $1.47 less than any other complete air service."

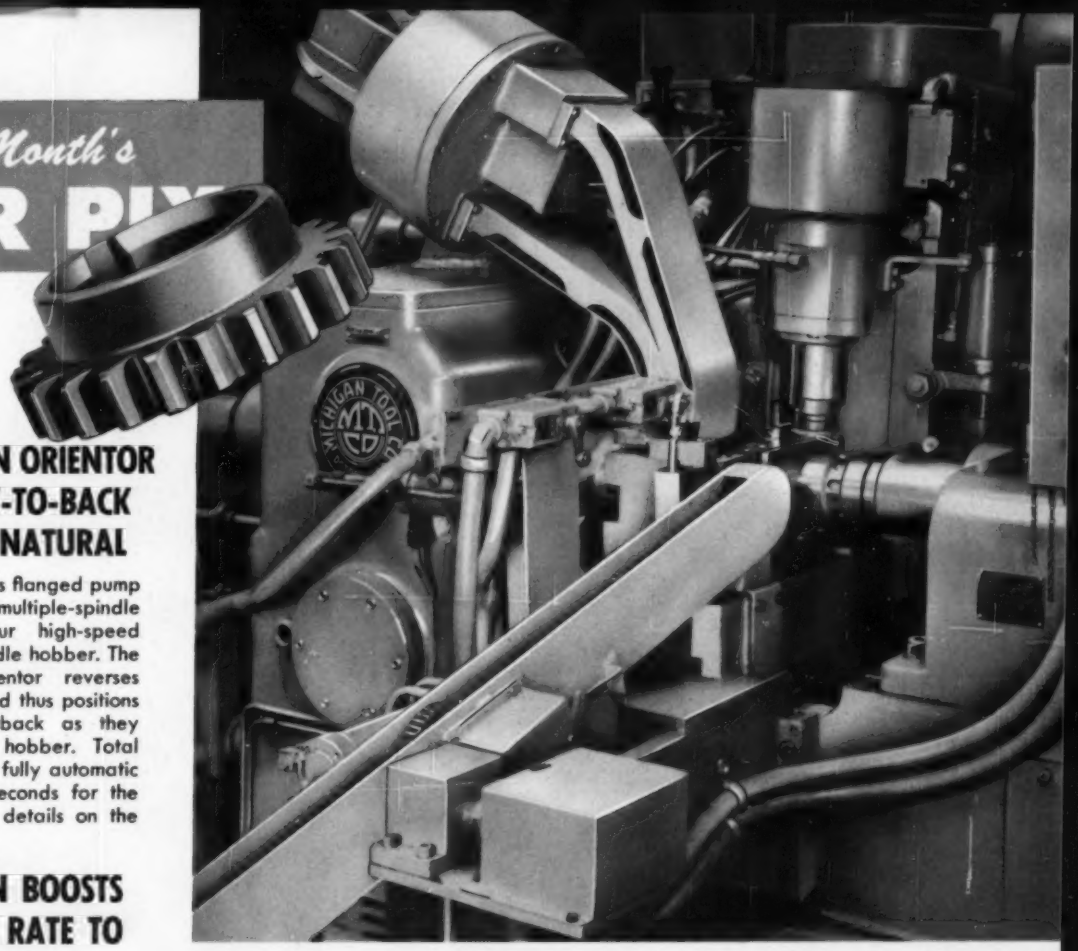
Air Express

30 YEARS OF GETTING THERE FIRST *via U. S. Scheduled Airlines*

CALL AIR EXPRESS ... *division of* **RAILWAY EXPRESS AGENCY**

This Month's

GEAR PI

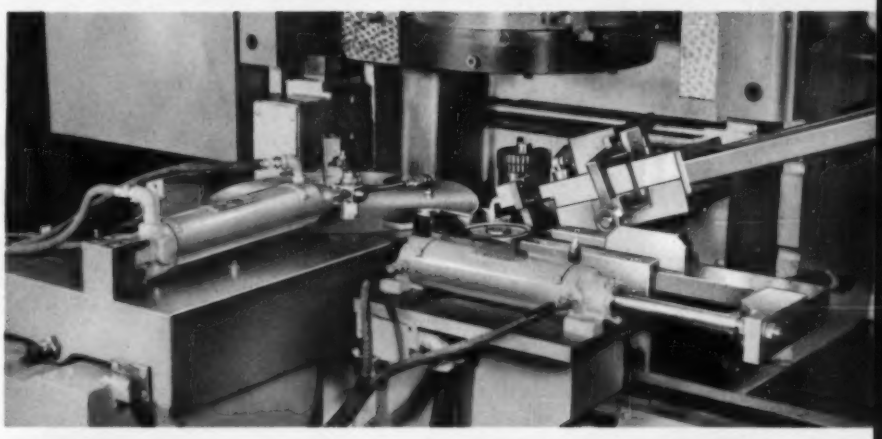


NEW MICHIGAN ORIENTOR MAKES BACK-TO-BACK HOBBING A NATURAL

Even on parts like this flanged pump gear, you can get multiple-spindle capacity from your high-speed Michigan single-spindle hobber. The new Michigan orientor reverses every other gear and thus positions two parts back-to-back as they go into the gear hobber. Total loading time for the fully automatic cycle is only four seconds for the two gears. Ask for details on the No. 1445 hobber.

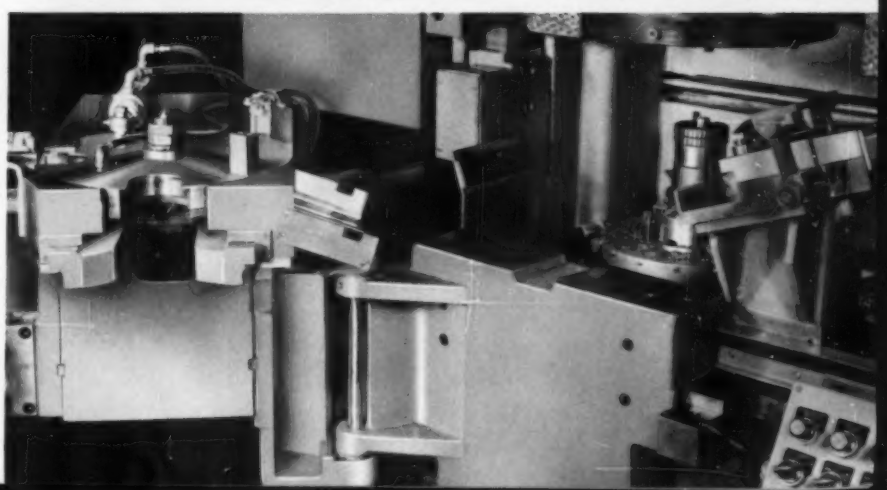
AUTOMATION BOOSTS SHEAR-SPEED RATE TO 180 PER HOUR

Automatic two-at-a-time parts loading and unloading has this Model 1853 Shear-Speed running at 100% efficiency producing 180 clutch hubs per hour. The work? A 36-tooth involute spline on a face width of .580 inches with a diametral pitch of 9.750. Pressure angle is 14½°. Parts are automatically positioned in pairs, fed, advanced, indexed 90° and picked up on a hydraulic arbor. Loading time is 8 seconds. Automatic cutting cycle for both parts is 32 seconds.



AUTOMATION SWINGS CLEAR FOR TOOL CHANGE ON SHEAR SPEED

Any interference of automating devices with tool changes is avoided on this Shear-Speed with a swing-out arrangement. The hinged mechanism swings the loader, index table and index slide completely clear of the machine. Pin-locked stops assure positive alignment.

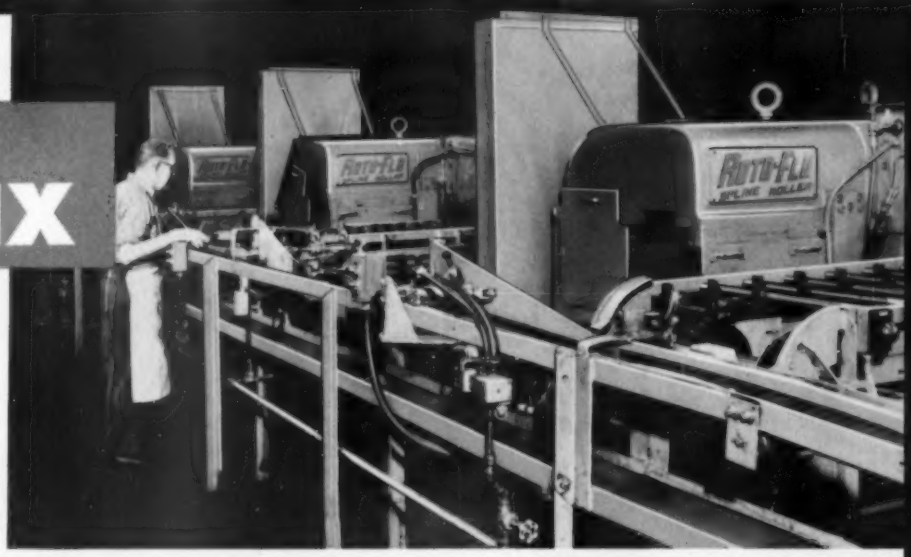


MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.
IN CANADA: COLONIAL TOOL CO., LTD.

This Month's

GEAR PIX

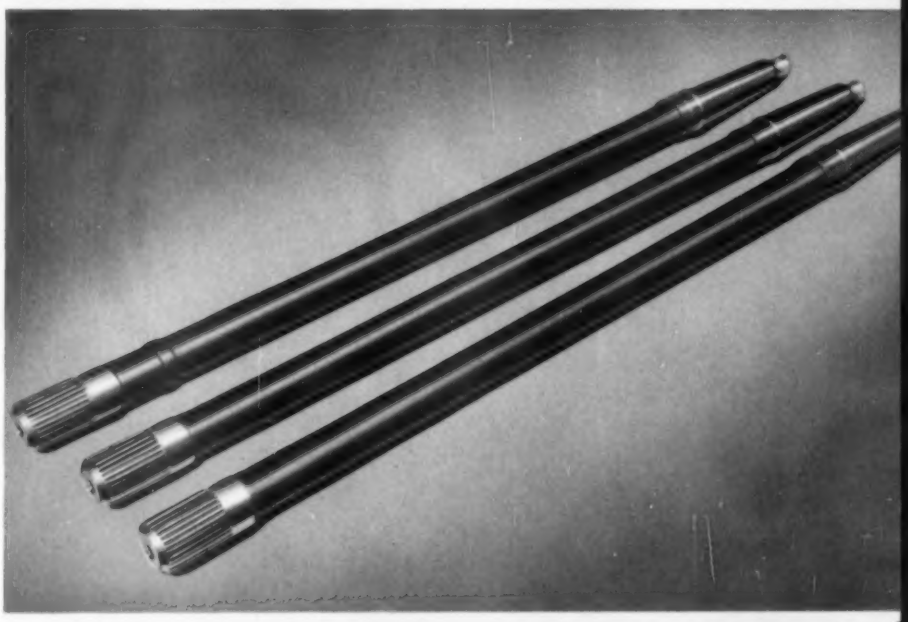


THESE 3 ROTO-FLOS WILL SPLINE 2½ MILLION AXLE SHAFTS IN 1957

At a nominal tool cost, these 3 machines are producing all the splines on all the rear axle shafts for 5 lines of cars.

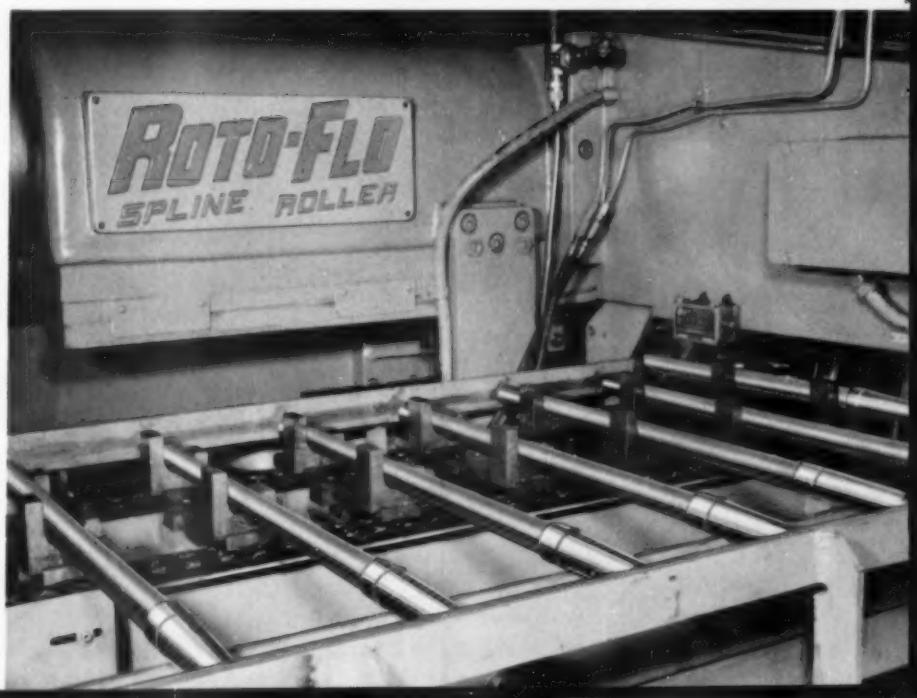
Here is the story:

No. of Roto-Flos	3
No. of operators	1
Output rate	1080/hr.
Surface finish	5 microinches RMS
Shafts per grind	123,000
Tool change time	20 minutes
Outside dia.	1.290 in.
No. of teeth	30
Spline length	1.62 in.
Diametral pitch	24/48
Pressure angle	30°



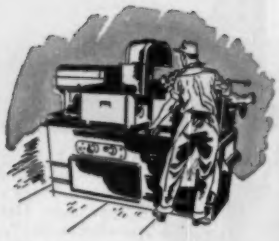
• • •

Roto-Flo is a development of Michigan Tool Company, the nation's gear production headquarters. The Roto-Flo process cold forms toothed and grooved parts—gives you a superior product in a matter of seconds instead of minutes. Roto-Flo machines will lower your capital investment, reduce direct labor costs, cut floor space needs, drop upkeep to the minimum, give you amazingly high tool life. For the story on Roto-Flo ask for "Chipless Production" (Bulletin RF-55). Write for your copy today.



MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.
IN CANADA: COLONIAL TOOL CO., LTD.



"TRUKUT® increased production 4 times..."

A small Mid-Western machine shop was confronted with an economic problem – production costs were too high – tool life was too short. While engaged in the job of cutting threads on 1020 16-gage electric welded steel tubing, the shop called in Sinclair Representative Raymond F. Ohm for help.

Mr. Ohm reports: "Tool life was a maximum of only 100 pieces before burning took place. Thread was very rough, due partly to chatter because of thin wall of tube."

"I recommended Sinclair TRUKUT® EP Soluble Oil, Grade C, because it affords greater emulsion stability, longer tool life and better finishes with close tolerance. It also gives a greater cooling and load-carrying capacity to prevent tool welding and burning."

"With TRUKUT, *production has been increased four times.* Four hundred or more pieces are produced before tool is replaced. Also – finish of threads is finer, and general appearance of the finished piece is better."

"The shop found TRUKUT EP, Grade C, so satisfactory that it now uses TRUKUT exclusively."

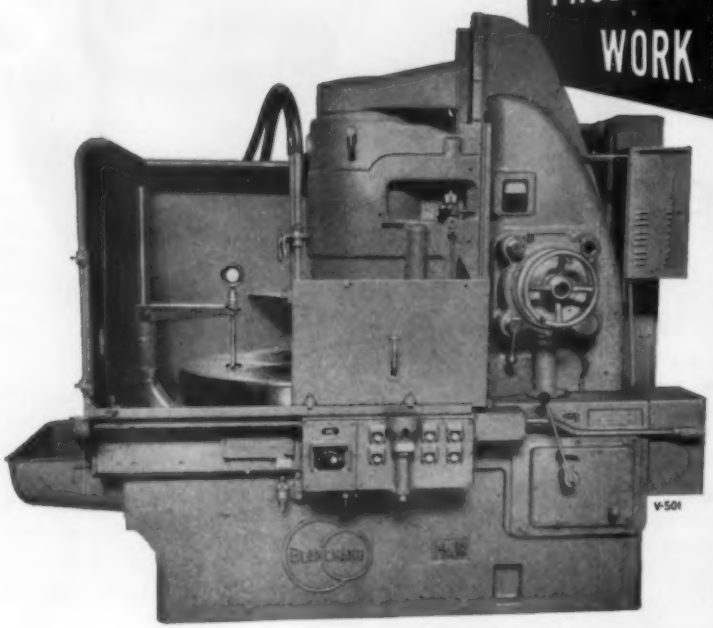
If *you* have a problem with cutting or grinding coolants, it will pay you to look into the advantages of Sinclair TRUKUT EP Soluble Oils. Contact your local Sinclair Representative, or write to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation.*

DINO, the Sinclair Dinosaur, says:

SINCLAIR

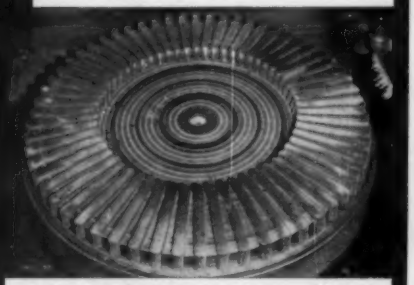
CUTTING OILS and COOLANTS

for BEST results in surface grinding...
PUT IT ON THE BLANCHARD



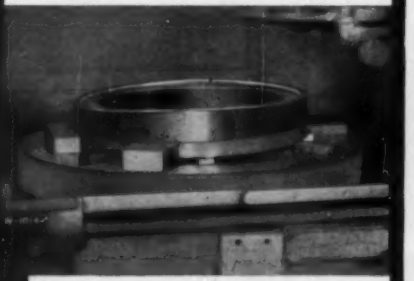
PRODUCTION WORK

SIDE PLATES. 9" x 18" plates ground from rough on No. 18 Blanchard with 36" chuck. Stock removal 1/16" to 1/8" per side. Held flat within .003", parallel to .001", and to dimension tolerance of ±.001". Production: 30 surfaces per hour.



CONNECTING LEVERS. Cast iron levers ground in special magnetic fixture with pins located in "vee's". Stock removal per side is 1/32" to 1/16"; must be flat and at right angles to pins. No. 18 production: 180 pieces per hour, compared to 20 pieces per hour by former method used.

MAINTENANCE AND ODD LOT WORK



HARDENED STEEL PUNCHES. This 24-13/16" dia. punch, reground on a No. 18, is centered radially on 36" magnetic chuck. Duplicate circumferential and radial shear reliefs are generated with two setups.

GRANITE SURFACE PLATES. A No. 18 Blanchard reconditions this 18' x 34" granite surface plate by grinding it flat within .0002". 3/16" of stock is removed in 5 hours.

Blanchard Grinders are used throughout industry on surface grinding jobs that demand the utmost in production, finish and accuracy.

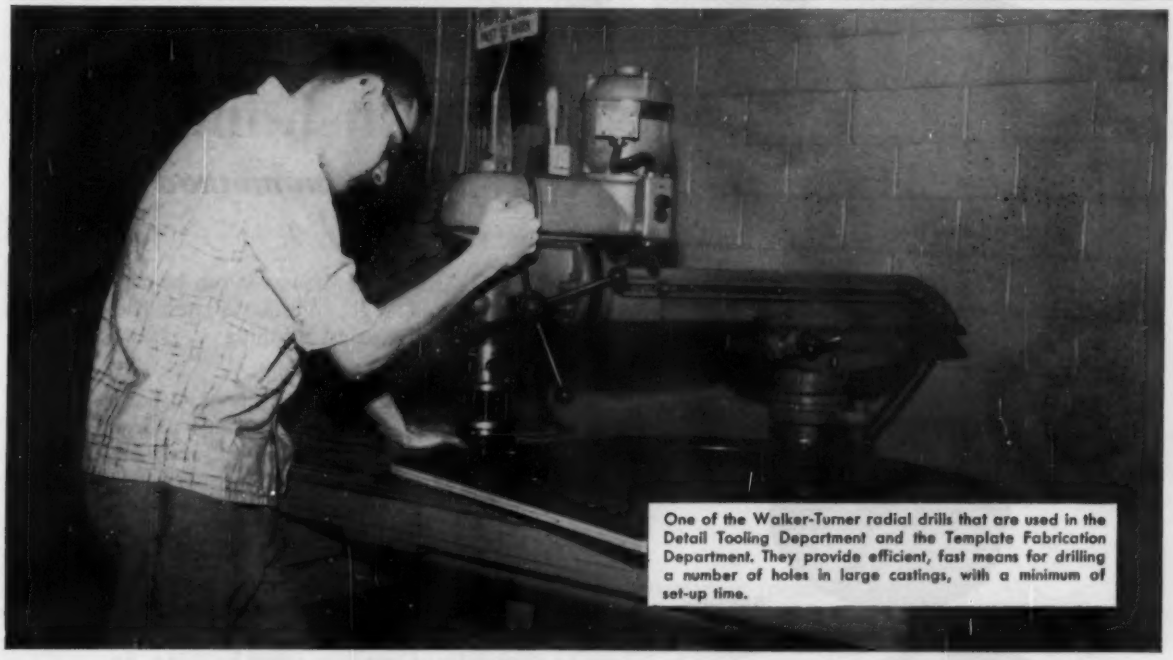
Whatever *you're* surface grinding, there's a Blanchard designed to do the job speedily and accurately.

PUT IT ON THE **BLANCHARD**

Send for free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

INDUSTRY REPORTS ON WALKER-TURNER



One of the Walker-Turner radial drills that are used in the Detail Tooling Department and the Template Fabrication Department. They provide efficient, fast means for drilling a number of holes in large castings, with a minimum of set-up time.

At North American Aviation, Columbus, O.

WALKER-TURNER RADIAL DRILLS IN CONSTANT USE FOR 6 YEARS — AND STILL GOING STRONG!

In the Template Fabrication Department of North American Aviation, two W-T radial drill presses are utilized in a production-line operation for making all router jigs. *These two Walker-Turner units have been in constant use for six years... and have been overhauled only twice.*

In this set-up, positioning holes are drilled in the jig on the first press. Then the work is passed on to the second Walker-Turner radial drill, where the operator drills or countersinks the holes as necessary. It's fast, efficient and convenient.

The Company has found the versatility, rugged construction, and low maintenance of other Walker-Turner "Light-Heavyweights" also make them ideal for many tooling and production jobs in other departments.

Now—A New, Improved Walker-Turner Radial Drill Press

that's even stronger, more versatile, easier to operate.

walker-Turner

With its all-new, heavy-duty head assembly, the improved Walker-Turner radial drill press offers all the ruggedness, versatility and efficiency of larger machine tools costing several times as much.

Ask your W-T distributor to demonstrate the many outstanding features of this new line of "Light-Heavyweights." He's listed under "Tools" in your telephone directory. Or write for his name and literature.

Available in 24 models with either 4¼" or 6" spindle travel.

WALKER-TURNER
Division of Rockwell Manufacturing Co.
Dept. WJ-21, 400 N. Lexington Ave., Pittsburgh 8, Pa.

OSBORN BRUSHING METHODS *worthy of your confidence*

BEFORE BRUSHING

AFTER BRUSHING

Precision brush finishing

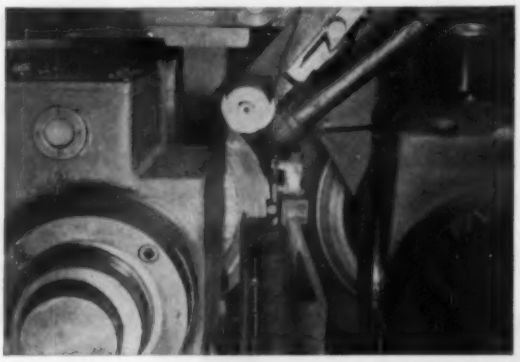
mass-production method

PRECISION parts by the thousands can be surface finished . . . at high, continuous rates. The method . . . Osborn Centerless Brushing . . . is fast, economical.

Cylindrical parts are fed past a revolving Osborn Matic® Brush. Surface finishes are refined to low microinch readings, grinding burrs are removed and surface junctures blended to reduce stress concentrations.

With Osborn Centerless Brushing, uniform quality of product is maintained. A wide variety of parts can be handled with the same basic brushing method.

Why not check what operations in your plant can be done at lower cost with power brushing. An **O**sborn **B**rushing **A**nalysis will show you how. There is no obligation, of course. Write today. *The Osborn Manufacturing Company, Dept. C-67, Cleveland 14, Ohio.*



Cylindrical parts precision finished automatically and economically with Osborn Matic® Brushes.

Write TODAY for the new 100-page Osborn Catalog 210-C

Osborn Brushes

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING MACHINES • FOUNDRY PRODUCTION MACHINERY

HERE'S A QUESTION YOU CAN ANSWER FAST!

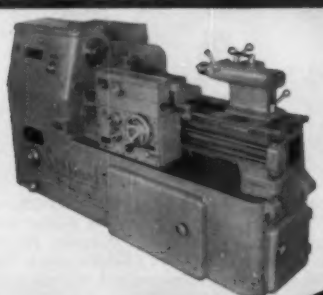
Which threading machine delivers the *maximum* in speed, accuracy, versatility and all-around efficiency?

The answer: Cri-Dan, of course . . . the single-point threader that is setting many a record for accomplishing tough jobs beyond the capacity of ordinary machines.

Whether your particular job calls for the large capacity, heavy-duty Cri-Dan "E" or the smaller Cri-Dan "B", they're both champions in their class.

Before you buy *any* threading machine, by all means check on Cri-Dan. Write Lees-Bradner for the complete, revealing story.

CRI-DAN



SPECIFICATIONS	CRI-DAN "B"	CRI-DAN "E"
Threading Range	6 TPI—48 TPI	2 TPI—48 TPI
Max. Thd. Dia. (Internal)*	6"	16"
Max. Thd. Dia. (External)*	4"	12"
Length Between Centers	36"	2' 6", 5' 6", 8' 6"
Spindle Speeds	145 to 2800 RPM	50 to 1400 RPM

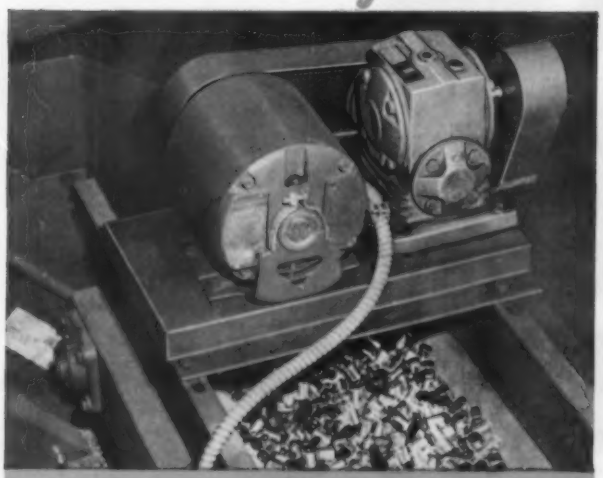
Conditions permitting, these diameters can be extended

CRI-DAN DIVISION
Lees-Bradner
CLEVELAND 11, OHIO, U.S.A.

Cost-wise design calls for STANDARDIZED

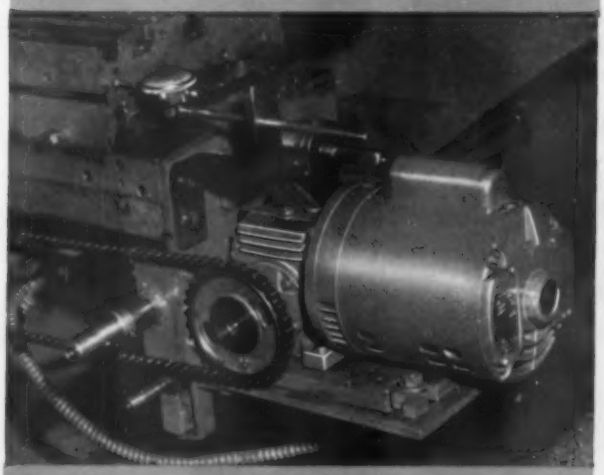
BOSTON gear SPEED REDUCERS

FROM STOCK!



LASTING POWER ECONOMY, long wear, easy maintenance and quiet operation make Boston Gear Speed Reducers the practical choice for drives in materials-handling equipment. A 100 Series Model T Reductor is used in the conveyor drive illustrated, where production of 4,000,000 lamp bases per day requires continuous, trouble-free operation.

COST OF SPECIAL MACHINES IS MUCH LESS when designed around Boston Gear standardized stock components. A 100 Series Model VMW Ratiomotor drives this automatic stripping and soldering machine for fuse plug lead wires. Assembly also includes standard stock Boston spur gears, rack, pillow blocks, pulleys, sheaves, and bushings.

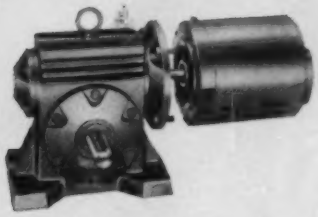


INCREASED COOLING EFFICIENCY of the finned housings of Boston Gear Speed Reducers dissipates heat rapidly. This permits compact design and higher torque capacity, of special advantage in machine tool drives like the 100 Series Model M Ratiomotor illustrated, and where space is limited, or where high area temperatures prevail.

STANDARDIZED VARIABLE SPEED DRIVES, assembled from Boston Gear stock parts, simplify the design job, and save the time required to procure special equipment. The illustration shows a Boston Gear Variable Speed assembly with a Type TW Reductor, used with Boston stock sprockets and chain to drive conveyor belt of a heat-treating furnace.

Since Boston Gear *standardized* Speed Reducers take top-rating in any comparison — why pay more, why wait for "specials"? Your nearby Boston Gear Distributor can deliver any model you need, *from stock.* His factory-trained specialist will furnish any information you need to simplify drive design and assure lasting economy. Be cost-wise . . . STANDARDIZE and SAVE. Boston Gear Works, 60 Hayward St., Quincy 71, Mass.

DETACHABLE MOTOR DESIGN OF BOSTON Gear RATIOMOTORS permits motor change in minutes continued operation with spare.

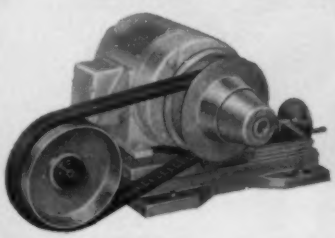


The standard end-mounted motor on all 100 Series RATIOMOTORS is easily detachable — can be changed quickly and easily. The gear assembly remains undisturbed, so no realignment is required.

The detachable motor design also makes any 100 Series RATIOMOTOR readily adaptable to changing conditions of operation. You can easily replace the original motor with other types . . . totally-enclosed, explosion-proof, etc.

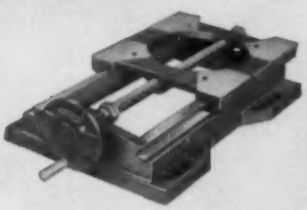
With today's production demands, you need the most dependable protection against downtime losses. Design around Boston Gear RATIOMOTORS and make this easy maintenance feature a money-saving advantage of your assemblies.

NOW — BOSTON VARIABLE SPEED DRIVES — FROM STOCK



For use with ½ and ¾ HP motors to provide constant torque, infinitely variable, 3 to 1 speeds — in any range between 1750 RPM and .5 RPM. Assembly of STANDARD STOCK parts includes adjustable Motor Base, self-contained, spring-tension Motor Pulley, flat driven Pulley, and heavy duty Belt.

BOSTON VARIABLE SPEED REDUCTOR DRIVES consist of above parts with addition of a 100 Series REDUCTOR — Type V, TW, V, or VW.



ADJUSTABLE MOTOR BASE

CALL YOUR **BOSTON Gear** DISTRIBUTOR

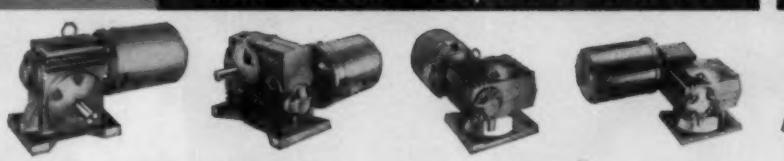
For nearest Distributor LOOK UNDER "GEARS" in the 'Yellow Pages'

See Catalog No. 56 for complete specifications and selection data.

1605 TYPES and RATIOS **FROM STOCK** AT FACTORY PRICES

REDUCTORS Ratios 1:1 to 3600:1 .004 to 50 HP

RATIOMOTORS Output RPM .49 to 175



FLANGED REDUCTORS

Gear assemblies of Ratiomotors, sold without motors. You buy and attach your choice of motor.

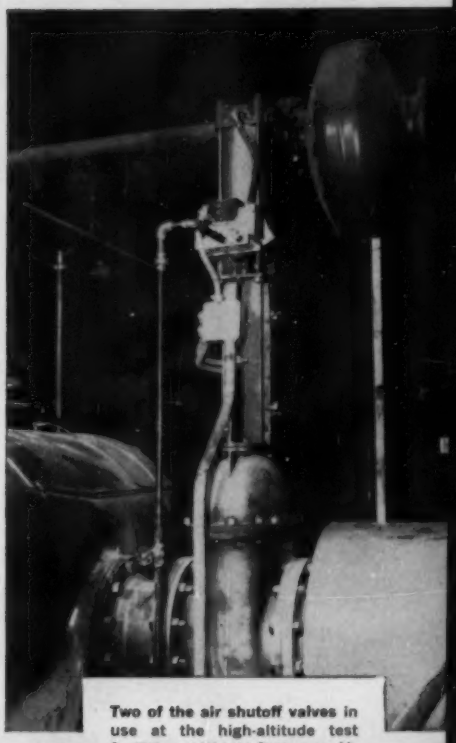
Low-temperature air shutoff valves

To quote J. L. Williams, Vice-President and General Manager of Fabri Valve, "We chose USS 'T-1' Steel for its toughness, impact strength, its quality of handling low temperature applications. Moreover, advantage could be taken of the minimum yield strength of 90,000 psi in reducing thickness, thereby reducing cost."

S. L. Kum, Chief Engineer, inspects an air shutoff valve. "USS 'T-1' Steel is what we needed in this job. It has all the qualities that this low temperature application calls for. And the weldability of USS 'T-1' Steel meant a great deal to us in cutting costs and time in constructing the valves."

fabricated from USS "T-1" Steel

...faster ...stronger ...at lower cost!



Two of the air shutoff valves in use at the high-altitude test facilities at Wright-Patterson Air Force Base, Dayton, Ohio.

THE FABRI VALVE COMPANY of America, in Portland, Oregon, recently used USS "T-1" Steel for the construction of two special types of valves for a U.S. Air Force high-altitude test facility.

The valves—two 12-inch and one 16-inch—are electric-motor-operated wedge-gate valves. They are subject to temperatures from well below 0°F. to +300°F., and pressures of 37.5 psi absolute plus a shock load of 200 psi gage. USS "T-1" Steel was used to fabricate the body, chest and bonnet, body flanges, chest and bonnet flanges, gate assembly, packing gland, and yoke.

Here are the steps followed in fabricating these valves:

1. **USS "T-1" Steel plates go to boiler shop for bending and shearing.**
2. **If a raised face is called for, it is welded on.**
3. **Parts go to shop for intermediate machining.**
4. **Parts returned to boiler shop for partial assembly and finished welding.**
5. **Sandblasting.**
6. **Valves (partially assembled) go to shop for final machining and assembly.**
7. **Valves tested and inspected to insure conformity with specifications and capability of performing job required.**

Fabri Valve Company officials estimated that by using USS "T-1" Steel, the entire job of constructing the special valves was trimmed by approximately 25 per cent. USS "T-1" Steel's unique combination of properties—fabricability with high yield and ultimate strengths, extraordinary toughness at high and low temperatures, and impact-abrasion resistance—mark it as just the steel to improve *your* product while cutting your costs. For more information, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

United States Steel Corporation, Pittsburgh
Columbia-Geneva Steel Division, San Francisco · Tennessee Coal & Iron Division, Fairfield Ala.
United States Steel Supply Division, Warehouse Distributors
United States Steel Export Company, New York

USS "T-1" CONSTRUCTIONAL ALLOY STEEL

"USS" and "T-1" are registered trademarks

UNITED STATES STEEL

Balance

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CUTTING LIFE

An almost perfect balance of *toughness, red hardness* and *wear resistance* enables duMont Tool Bits to hold a keener cutting edge longer, gives you a bonus of cutting life in every bit.

duMont

TOOL BITS

High Speed Ground Square and Rectangular

Fill in the coupon below to get full information. Make your own performance tests and see what a difference *balance* can make.

MAIL TODAY - SAVE TOMORROW

The duMONT CORPORATION, Greenfield, Mass.

MAIL FREE Tool Bit COMPARISON CHART, CATALOG and PRICE LIST A

Name.....

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Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Hardness testing

Dear Sirs:

The special report by Vincent E Lysaght on "Hardness Testing in the Shop" (*AM*—Aug 12 '57, p133) renders a valuable service to the users and makers of machine products. In the ever-increasing rush of things, it seems natural enough to assign more and more tasks to machines. Understandably if not excusably, screwy results sometimes obtain.

In the case of hardness-testing-machine data, a questioned material's resistance to indentation when forcing into it an object of certain shape and material is sometimes heedlessly accepted as a direct, absolute criterion of wearability, strength, toughness, and such-like actual properties or practical requirements in some process or service very unlike that of the indentation.

This indiscriminate application of hardness-testing-machine data alone may cause acceptance of inferior material and rejection of material actually qualified to meet practical requirements. Meanwhile, the testing machine's reputation unfairly suffers while its enormous value—when properly applied—doesn't achieve broadest application so quickly as it deserves.

Mr Lysaght's paper will contribute very much toward a more general understanding of the intelligent application of hardness-testing equipment. One can hardly suggest any change in it unless it would be general use of italics to emphasize the limitations of such testing equipment and the need for correlation with other physical properties in order to arrive at needed, usable practical criteria and sensible decisions. I find very little that could be added to it.

In preparing samples, besides avoiding work-hardening, care must be taken when grinding to avoid drawing hardness. Sometimes stoning or lapping is preferable. But as it is, the paper is complete enough for any thoughtful reader, who will find italics unnecessary.

And it is especially and surprisingly good because of its objectivity. Although connected with

SHOPMATES

N. Jarvis

I SAW THE WHOLE SHOW — HE DRILLED A BOLT HOLE IN THE WRONG PLACE AND SNEAKED BACK DURIN' LUNCH TO WELD IT UP — THEN MELTED THE WHOLE THING IN TWO!!
THE BROOKLYN BRIDGE OR THE EIFFEL TOWER — IT'D BE ALL THE SAME TO HIM — LUCKY THING FOR HUMANITY THAT SOME GUYS DON'T WORK OUTSIDE THE SHOP!
N. JARVIS

EXTRA DRILLING CAPACITY FOR YOUR TOOLROOM

LELAND-GIFFORD NO. 3 MVB TOOLROOM DRILL PRESS

A companion machine to the widely used Leland-Gifford No. 2 LMS Toolroom Drill Press — providing extra capacity with comparable features and conveniences. This machine is always available to help with heavy-duty production work while handling the general run of toolroom drilling and tapping with effortless speed and ease.

✓ *check these features*

- √ Speeds from 33 to 1,800 RPM.
- √ Capacity of No. 3 Morse Taper.
- √ Extra large 40½″ x 23½″ or standard 24½″ x 23½″ tee-slotted table.
- √ 24″ swing with 12″ overhang. Geared power feed with feed rates of .006″ — .012″ — .018″ per revolution.
- √ Illuminated indicating shift with cutting speed chart.
- √ Conveniently located hand wheel for changing spindle speeds and shifting back gears without stopping machine.
- √ Positive stop for accurate depth adjustment.
- √ Foot switch start-stop motor control.
- √ Counterbalanced sliding head.
- √ Built-in light for table and work illumination.

Write for complete information.

LELAND-GIFFORD

Drilling Machines

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NEW YORK
75 S. Orange Ave.,
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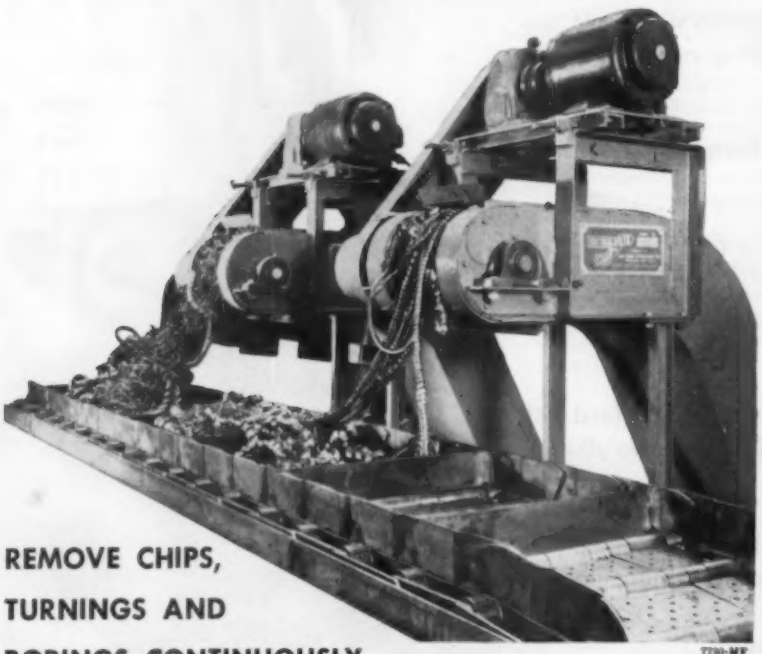
ROCHESTER 12
P. O. Box 24,
Charlotte Station

LOOK...NO HANDS!

That's right! The May-Fran CHIP-TOTE permits the continuous operation of machine tools by eliminating down-time for scrap removal . . . skilled workers stay on the job . . . production increases by as much as 20%! Versatile CHIP-TOTE conveyors are available in a wide range of sizes to serve practically any type or size of machine tool. Conveyor speed is adjusted to meet the scrap removal needs of the machine.



7780-MF

REMOVE CHIPS, TURNINGS AND BORINGS CONTINUOUSLY AND AUTOMATICALLY WITH A **MAY-FRAN CHIP-TOTE**

Write today for your copy of Bulletin MF-640

MAY-FRAN ENGINEERING, INC. 1677 Clarkstone Rd., Cleveland 12, Ohio

a producer of one kind of such machines, Lysaght gives consideration to other kinds. Besides being good engineering, this is a very high order of salesmanship. No wonder he was promoted to general sales manager.

Lew Suverkrop
Bakersfield, Calif

Wheel dresser

Dear Sirs:
In "Spot news" (*AM*—July 1 '57, p65) you mentioned a "Time and cost-saving method of dressing metal bonded diamond wheels" with the use of a "rubberized abrasive block."

We would appreciate it very much if you would please send us the name of the firm producing these blocks or any other information you may have pertaining to the article.

R W Grau
Milwaukee, Wis

Dear Sirs:
. . . "time and cost-saving method of dressing metal bonded diamond wheels." I would appreciate further information. . .

Charles G Weigand
Chicago, Ill

Dear Sirs:
. . . "rubberized abrasive block." We are rather interested. . .

G C Ovan
Scunthorpe, England

The rubberized abrasive blocks are made by the Cratex Manufacturing Co, 81 Natonia St, San Francisco 5, Calif. The company

Helpful Henry

by L. Hoppes

"I just hired a new man to replace the one you let go this morning, Mr Fall!"

will be pleased to supply complete information on their product—Ed.

CALENDAR

SOCIETY OF AUTOMOBILE ENGINEERS —Aeronautic meeting and display, Sept 30-Oct 5, Ambassador Hotel, Los Angeles, Calif.

AMERICAN SOCIETY OF LUBRICATION ENGINEERS and AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Lubrication conference, Oct 7-9, Royal York Hotel, Toronto, Ontario.

ILLINOIS INSTITUTE OF TECHNOLOGY and ARMOUR RESEARCH FOUNDATION—National Conference on Industrial Hydraulics, Oct 17-18, Hotel Sherman, Chicago, Ill.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Power conference, Oct 21-23, Americus Hotel, Allentown, Pa.

AMERICAN SOCIETY FOR METALS—National metal exposition and congress, Nov 4-8 (World metallurgical congress, Nov 2-8), International Amphitheatre, Chicago, Ill.

AMERACAN INSTITUTE OF ELECTRICAL ENGINEERS — Annual machine tool conference, Nov 6-8, Hotel Schroeder, Milwaukee, Wis.

AMERICAN STANDARDS ASSOCIATION —National conference, Nov 13-15, St Francis Hotel, San Francisco, Calif.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Annual meeting, Dec 1-6, Statler Hotel, New York, NY.

SOCIETY OF AUTOMOTIVE ENGINEERS —Annual meeting and display, Jan 13-17, The Sheraton-Cadillac and Statler Hotels, Detroit, Mich.

SOCIETY OF AUTOMOTIVE ENGINEERS —Production meeting and forum, Mar 31-Apr 2, The Drake, Chicago, Ill.

SOCIETY OF AUTOMOTIVE ENGINEERS —Aeronautic meeting and display, Apr 8-11, Hotel Commodore, New York, NY.

AMERICAN WELDING SOCIETY — Spring meeting and welding show, Apr 14-18, Statler Hotel, St Louis, Mo.

AMERICAN SOCIETY OF TOOL ENGINEERS — Tool show, May 1-8 (closed Sunday), Convention Center, Philadelphia, Pa.

AMERICAN SOCIETY FOR METALS—Southwestern metal exposition and congress, May 12-16, State Fair Park, Dallas, Texas.

...and parts are finished without rehandling on

GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.

A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

At Massey-Harris-Ferguson

Natcos Save 100 Parts...

Three multiple-spindle Natcos bore, drill, spotface and tap the front end support for a Massey-Harris-Ferguson tractor

NATCO

60 Man Hours Every

on Rugged Axle Support Castings

Massey-Harris-Ferguson checked it two ways. Nine general-purpose machines would do the job—or 3 Natcos. They chose the Natcos for these reasons:

- *Saving of $30,000 in machine cost*
- *Saving of 60 man hours every 100 parts*
- *Saving of 65% in floor space*

The Natcos handle all drilling, boring, spotfacing and tapping—a total of 67 operations on the 182-pound front axle casting. The casting is heavy, irregular—tough to fixture and clamp. The Natcos meet production requirement of 11 parts per hour.

Natco provided complete tooling which features automatic clamping, cycling and chip blow-out. All three machines are of unitized construction, giving Massey-Harris-Ferguson the flexibility to run different parts of redesigns of the same part.

Let Natco Field Engineers point out cost-saving and time-saving methods on your next drilling, boring, facing or tapping job. Natco offices are located in Chicago, Detroit, New York, Buffalo, Boston, Philadelphia, Cleveland and Los Angeles; distributors in other cities.

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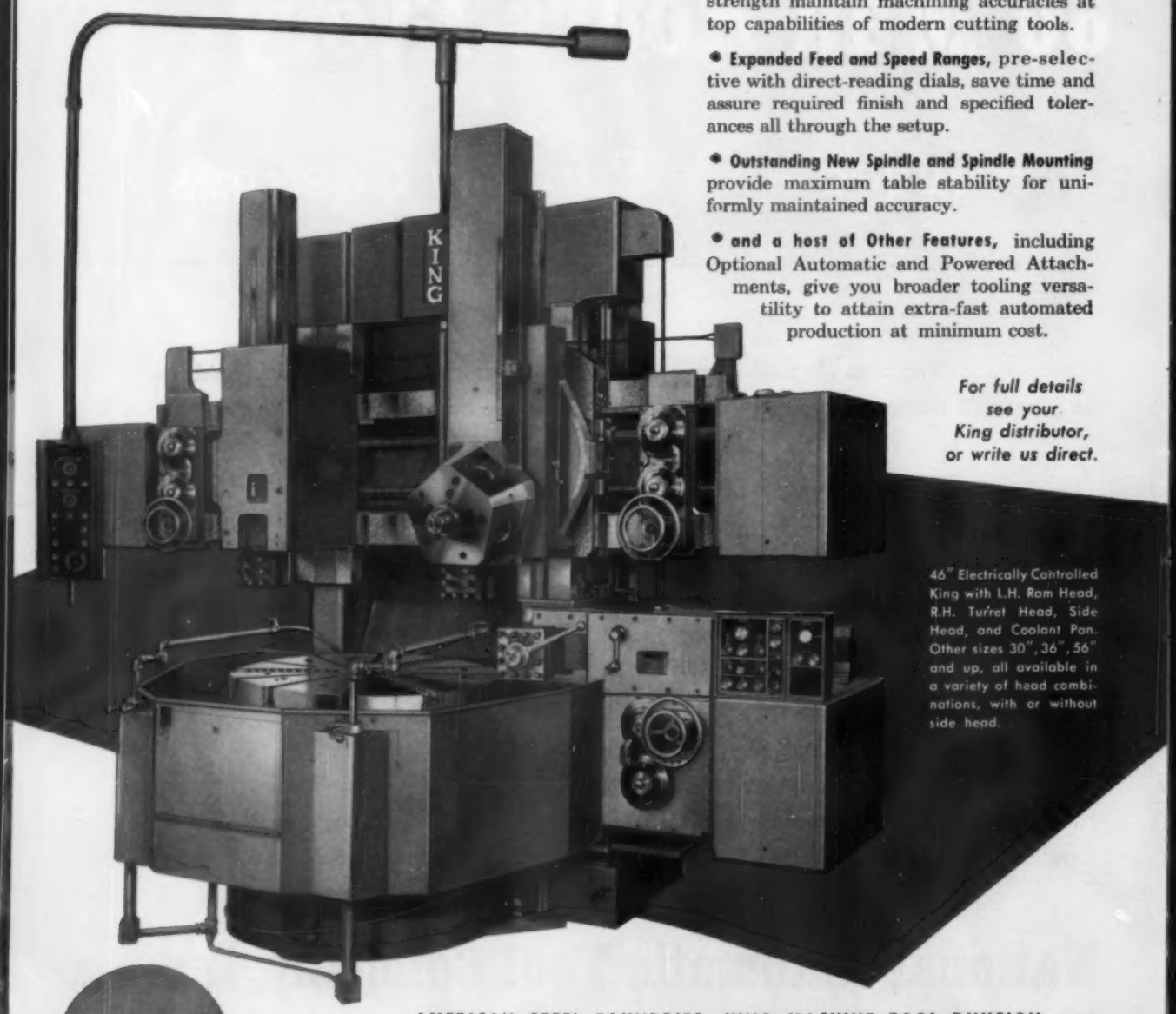

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KING Vertical Boring and Turning Machines

Spot news...

- **Laid-off aircraft workers are staying put,** confident that they'll be back on the job soon. While a few San Francisco plants sent representatives into Los Angeles to hire laid-off engineers, they weren't too successful. And virtually no Los Angles production workers have come up to San Francisco looking for work.
- **Dispersal of defense production,** which created such a stir a year or so ago (remember the "no more defense plants on either coast" edict?), is now a dead issue. Reason: Defense Dept thinking now shies away from the big M-Day production buildup upon which dispersal is based.
- **Cleveland storm window firm is making manufacturers out of distributors.** Company designs special tooling which is sold to the distributor on a low-payment basis, also sells them semi-finished materials for final assembly into sizes and styles required by customers at local level. Tooling setup for each of the firm's 70 distributors costs about $5000.
- **Too much emphasis is being placed upon making automatic machines today,** and too little upon their use, according to Jones & Lamson's M V Hayes, who feels that one day there will be as many types of tapes and cards as machines if something isn't done about it. His solution: make all input signals uniform as they come from a tape reader, wire all machines to a central control room, so they can be hooked into any extension and get standardized commands over the wire.
- **New process for making semi-precision sand molds for castings** combines carbon dioxide and a sodium-silicate-based binder, handles all castable metals, is said to combine close-tolerance aspects of shell molding and economy and time-saving advantages of CO_2 sand core process. Molds as thin as ½ in. are practical.
- **First single-spindle, five-axis profile milling machine** to be accepted by the Air Force has just passed tests at Giddings & Lewis, with flying colors. Spindle can be tilted longitudinally and transversely in addition to the conventional motions of three-axis profilers. All five motions are continuous and simultaneously controlled and synchronized by magnetic tape. It'll be used to finish-mill complex aluminum aircraft forgings.
- **Unique "flying press" that fabricates steel while the metal is on the fly,** and which turns out semi-fabricated metal sheet 2 to 3 times as fast as conventional equipment, has been installed at Standard Pressed Steel's Hallowell Division, Jenkintown, Pa. The 210-ft-long, 200-ton capacity press accomplishes this with rotary dies.
- **More than 100 types of new machine tools and equipment,** many of them automated, have been put into production in Russia in the last six months. Poland in the same period has produced 24 prototypes of new machine tools.
- **U S Chamber of Commerce is trying to protect college students** from "high-pressure job-recruiting tactics." Firms actively seeking future employees have increased from a prewar 1500 to 6000 today. Disapproved tactics: bidding up of salary offers, special payments, undue influence on student job choices by faculty members, elaborate entertainments.

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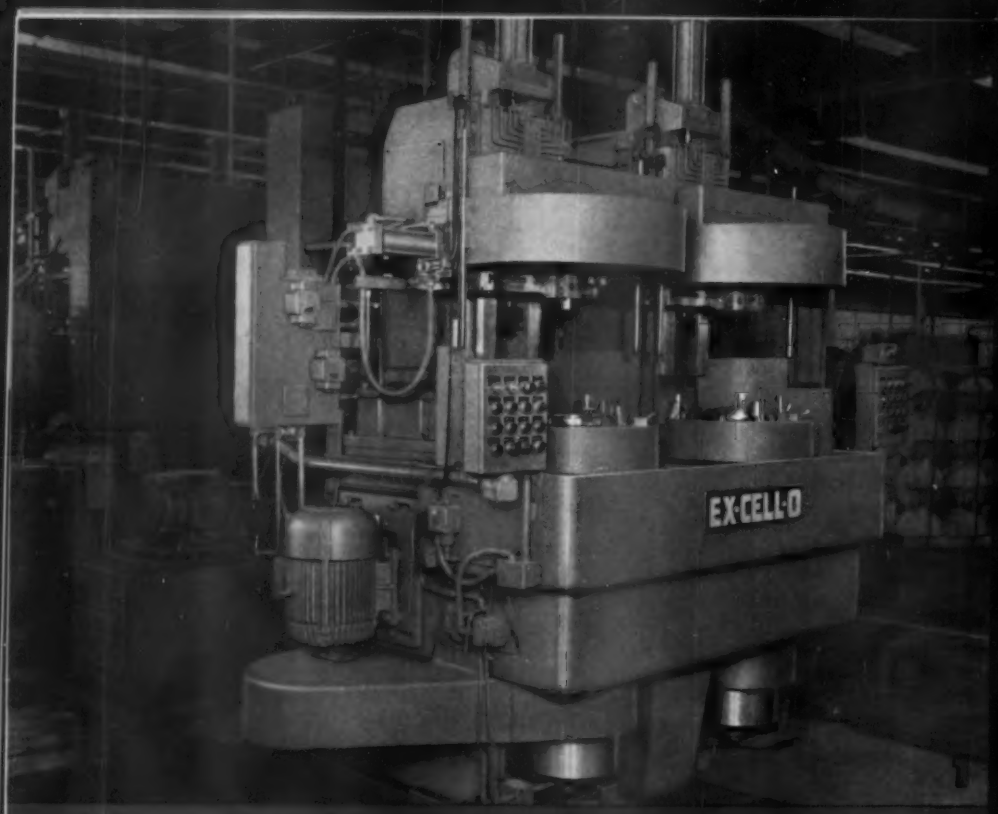

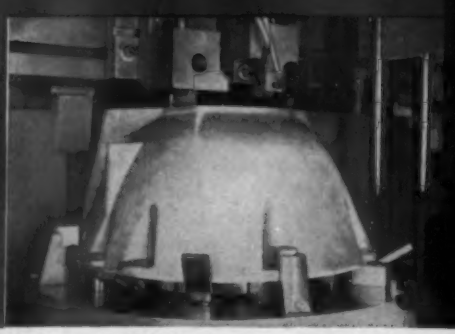

(XLO)

EX-CELL-O
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An overall view of the Ex-Cell-O Style 432 Duplex Vertical Machine, used for finish facing, boring and chamfering automatic transmission housings.

These are stations #1 and #2 of the first of the three Style 432 machines. Part at left is semi-finish faced, while part at right is finished on the opposite end by two tools, each making one pass.

Close-up of housing during the finish face, bore and chamfer operations. Housings are permanent mold aluminum casting.

57-71

Want Higher Production...?

Here's how one auto manufacturer did it

Urged by the upswing in automatic transmission demand, one of the "Big Three" installed several Ex-Cell-O Duplex Vertical Boring Machines. The two-station units rough and finish permanent mold aluminum torque converter housings at a rate of 164 per hour! Automatically, of course. Operations performed by this Style 432: turning, boring, facing, grooving and chamfering, alone, or in any combination.

Perhaps you have a volume production operation you would like to *double* at no increase in per-unit cost? Then you'll want to find out all about Ex-Cell-O Vertical Boring Machines. Their two-station construction automatically doubles operator output. Get in touch with your local Ex-Cell-O Representative soon. Or, if you prefer, write direct to Ex-Cell-O, Detroit.

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Washington ... NEWS REPORT

Contractors talk back...

The country's big defense contractors—including such outfits as General Electric, RCA, Worthington Pump and others—are after Pentagon officials to shake up the military's methods of buying hardgoods from its contractors.

They've wrapped up a bundle of complaints that have been brought to a head by the contract cancellations and stretchouts that have been made to carry out Eisenhower's orders to keep military spending around $38 billion a year and no higher.

Among their complaints: the Renegotiation Law is unduly repressive, they run short of cash because of the hold-down on progress payments, the Pentagon doesn't take company problems into account when cutting back on contracts.

The National Security Industrial Association has put into the hands of top Pentagon brass a detailed rundown of examples to show how Pentagon policies are making it increasingly risky to take on government work.

They would like to see government policy changed around to a hard rule of getting the best product at the lowest price. This would wash out the fringe operators, they say, and leave in the military business just those companies best equipped to do government work at a fair profit.

Pentagon officials are in the middle, of course. The budget cut-backs are real, they point out, and can't be carried out without some companies getting hurt.

Military officials also note that defense contractors must want government contracts or they wouldn't go after them—and that other companies (subcontractors and the like) are complaining that too much of the Pentagon's spending is already concentrated among too few suppliers.

Even missiles are hit...

The sweeping character of the Pentagon's crusade to hold back on military procurement is revealed by the fact that even the missile developers—heretofore untouchable—are now under pressure to watch their pennies.

For instance: Air Force has been ordered to reduce its purchases of ballistic missile prototypes; production plans for ballistic missiles are being scaled down; funds for the Navy's intermediate range Polaris have been reduced.

Biggest sign of the times: Now even missile engineers come under the Pentagon's restrictions on overtime pay.

Labor settlements tougher...

Bargaining looks tougher-than-ever for management in 1958. This year's settlements—all but wrapped up—outdistanced the year before by some 3¢ an hour, averaging over 10¢. On top of that, automatic increases for steel came to 16¢-an-hour so far, for autos, 15¢. This will be the floor for UAW's Walter Reuther and other labor leaders to launch their 1958 bargaining table demands.

A relatively new fringe benefit is going to be pushed, especially by the Machinists Union. This year's Machinist agreements more and more include severance payments to laid-off workers.

In the last seven years, severance pay clauses have soared in contracts. New government figures show the clause in 16% of surveyed contracts or double the 1950 total.

Aircraft buyers get help...

Another piece of federal aid may help boost the business of some aircraft companies. There's a new law on the books now that permits the Civil Aeronautics Board to guarantee loans to feeder airlines and helicopter lines for the purpose of buying equipment. Already, Fairchild has a plane ready to roll out to hit the short-haul market—that is, a replacement for the DC-3.

CAB can guarantee up to 90% of airline borrowings for equipment purchases up to a total of $5 million per airline.

Another bit of government financial help for airplane buyers is the passing of a law that permits the airlines to create equipment trusts, as the railroads can do for buying rolling stock. This law gives lenders first call on repossessing equipment bought with their money in the event of a bankruptcy.

Ferment in electronics...

Look for more ferment among electronics suppliers as a result of RCA's payment of about $11 million to Zenith Radio Corp for Zenith's dropping its 11-year-old antitrust triple damage suit over alleged patent monopoly. The settlement may touch off a new round of claims by other electronic manufacturers.

Philco Corp, early this year filed a similar triple damage suit against RCA. This suit followed the Justice Dept's antitrust charges, filed in 1954, that RCA has achieved an illegal position in the electronics industry, through illegal cross-licensing agreements with General Electric, A T & T, and Westinghouse Electric Corp.

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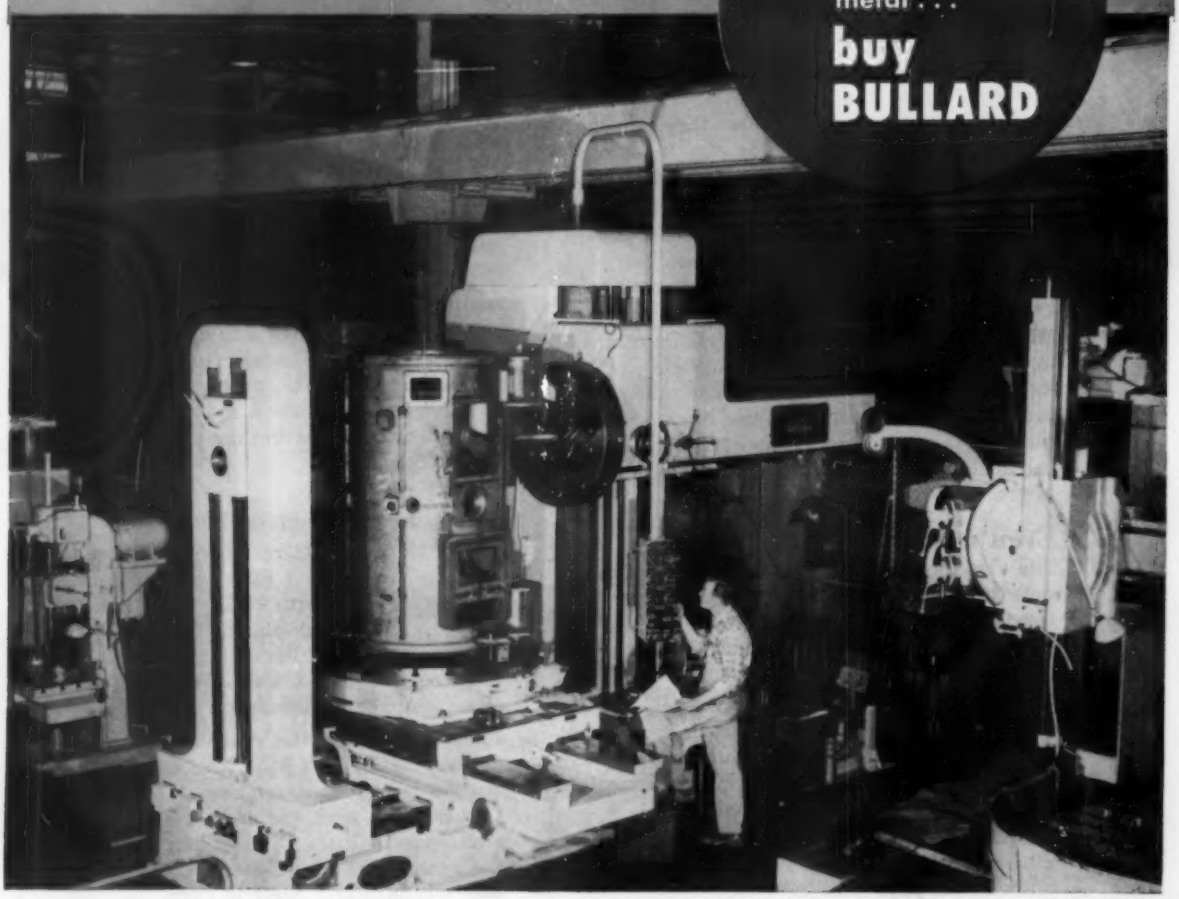

Detroit ... NEWS REPORT

Capital spending outlook ...

Detroit is pulling in its horns on capital spending. That, simply, is the answer to the question that makers of machine tools, metalworking equipment and other capital goods have been asking for the last several weeks—"When are the orders from Detroit coming through?"

We're talking about the purchase of machine tools, presses and the like, which in Detroit are called "facilities," as distinguished from tooling (dies, jigs, fixtures and similar equipment of a temporary nature).

The Big Three auto companies have plenty of capital in their respective socks, even though they may prefer not to spend it. Most new models will be on the road in quantity by the second week in November.

The first 10-day sales figures for any given make will provide the key to the future. If these figures are good, look for some shelved 1959 plans to be reinstated in the light of anticipation of 1958 profits.

If the figures are bad, the affected makes can be expected to advance the introduction date of features programmed for 1960.

Let's take Ford, for instance ...

It is in the area of facilities that Ford, for one, is trimming its sails for 1959. Using that company as an example, here are a few reasons why:

- **All of Ford's engine plants** are less than seven years old. And with the exception of one under construction in Ohio, each has been given an additional revamping within the last 18 months. As one Ford official puts it, "you just don't keep on building new plants."

- **Ford has new engines across the board** for 1958. There won't be another for at least five years—maybe even longer, depending upon the outlook for gas turbines at that time. The only thing that could change the picture is an economy trend on the part of the public. This could force production of an American-made small car.

Another broad factor is the auto industry's need to amortize the most tremendous capital facilities expansion in its history—from an unexpectedly low sales plateau of 6-million-units-or-so annual volume. This means that profits for this year and the next few years will be substantially down from the 1955 peak. And, naturally, less money will go for facilities.

Every single engineering suggestion, from a new engine on down to a new gear, is now being screened on the basis of (1) will it sell more cars? and (2) can it be made with existing facilities, or at most, with only minor changes?

There are other factors involved, too. For instance, Detroit machine tool people are awaiting word from Buick and Oldsmobile as to whether a new engine is in the works for 1959. Each of those GM divisions is certainly long overdue.

But today's de-emphasis on horsepower may well give these divisions a chance to carry on with their old engine. It is noteworthy that the 1958 Buicks will be rated at the same horsepowers as the previous models.

Plans for drastic engineering changes, that would involve the purchase of capital goods—things like moving the transmission back to a point adjacent to the rear-axle housing—are being pretty generally shelved to save money.

Only GMC Truck & Coach so far has committed itself to a new engine in 1959. Most, if not all, automakers can get along with minor refinements of their automatic transmissions.

That leaves just engineering odds and ends, such as a switch to an aluminum intake manifold, to require purchase of new facilities. And even that is small consolation to the makers of capital equipment, because such changes often mean nothing more than re-gearing a machine.

U S small car in the works?

A rumor, perhaps born of desperation, is circulating today in Detroit tooling circles to the effect that both Ford and General Motors are ready to ask for estimates on facilities for a small car. But this would mean that tooling orders would be placed ahead of construction—an indication that it's an unfounded rumor.

Modern small cars demand unitized body construction. In turn, that means a new plant, and there's no indication that any such plant is in the offing—unless quick conversion of existing defense plants is planned.

Even orders born of engineering underestimates are no longer in sight.

Why tooling orders are late ...

Tool and die people across the country have been wondering why tooling orders are so late in coming through this year. Reason is that the automakers figure it is cheaper to pay for a little overtime and be right than to pay for a crash program engendered from mistakes. They still have 60 days more to make up their minds.

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Aircraft and Missiles...

NEWS REPORT

The worst is over...

The nation's aircraft industry is feeling a little less in the dark over the future of aircraft and missile programs—as a result of a recent Air Force Procurement Conference in Los Angeles.

The Conference's top speakers, Air Force Secretary Douglas, and Lieut General C S Irvine, Deputy Chief for Materiel, talked turkey with industry executives, to wit:

The worst is over as far as cancellations and stretchouts go. But the Air Force must stay within its reduced budget as much as it can without sacrificing the nation's air power. This means every program, and every dollar spent within a program, will be closely scrutinized.

The defense market is going to be a highly competitive one from here on out, and it's going to take good company management to survive. Whether or not the Defense Dept will again wield the budget axe is largely up to the suppliers—if they can hold down costs, the Defense Dept will hold back the axe. In other words, the "marginal, high cost, late-delivery people" have to go.

Good news for California...

Secretary Douglas had a reassuring word specifically for southern California. He said that the area need fear no new cancellations or stretchouts "in the coming months." (This is taken to mean through fiscal 1958). And, he added, there's no reason to suppose southern California won't continue to get something like its present proportion of the aircraft and missile dollar—about 25-30%.

There's no reason for anyone in the aircraft industry to "hit the panic button," the speakers said, pointing out that budgeted expenditures for aircraft, missiles and related equipment during fiscal 1958 amount to $7 billion—only half-a-billion under 1957's peacetime record.

"Plans for the future," said General Irvine, "hold the prospect of a relatively stable outlay of dollars." He forecast a continuation of a $7- to $7.2-billion yearly outlay for new aircraft and missile end items.

AF's idea on procurement...

The Air Force will continue to require primes to subcontract a "substantial portion" of their work to small shops. The Air Force, too, will resist the tendency of primes to pull sub work back into their own shops, but not to the extent of favoring subcontracting for its own sake when it is uneconomical.

The Air Force "isn't in business to support the economy of a given segment of the population." And that applies to geographic location, too. The company that can do the best job for the least money will get the contract, regardless of its location, or whether it's a prime or a sub.

"Second sources" a dead duck...

The Defense Dept's "second source" policy has largely fallen by the wayside. While the Air Force likes to have two sources during R & D stages, "when it comes to production, for the most part we can't afford more than one." This policy applies to subs and primes.

From here on out, the Air Force is going to keep a jaundiced eye on overhead. It will expect "more pounds of hardware per labor hour, and more productive designs per engineering hour."

Under its new "expenditure control" policy, the Air Force is going to look over the primes' and subs' shoulders during the life of a contract. It's setting up procedures to control and forecast expenditures "right down to the plant, so we will be able to determine trends month by month, quarter by quarter, by contract and by company." If expenditures run higher than estimates, it's going to mean either a cutback in quantity or cancellation of the project.

But, said the General, "for the guy who's on schedule, whose estimates are good, expenditure control will be no worry."

The Air Force is going to take a dim view of facilities expansion, although there'll necessarily be some of it for new programs.

Douglas and Irvine shed some light on the transition from manned aircraft to missiles—but only some. Secretary Douglas said it is impossible today to determine the rate and extent of the transition but he said one thing is sure, "manned aircraft will be with us for a long while."

At the moment, the weapons system dollar is going about 35-40% to missiles, General Irvine said—but 15 years from now that could well be the percentage for manned aircraft in first-line equipment.

The recent Navaho cancellation and the impending selection between, or merger of, the Air Force's Thor and the Army's Jupiter will be the last cuts for some time in development programs for long-range delivery systems (that means both missiles and large bombers). All other projects, and that includes the two ICBM's—Atlas and Titan—"are sure to go down the road for quite a way."

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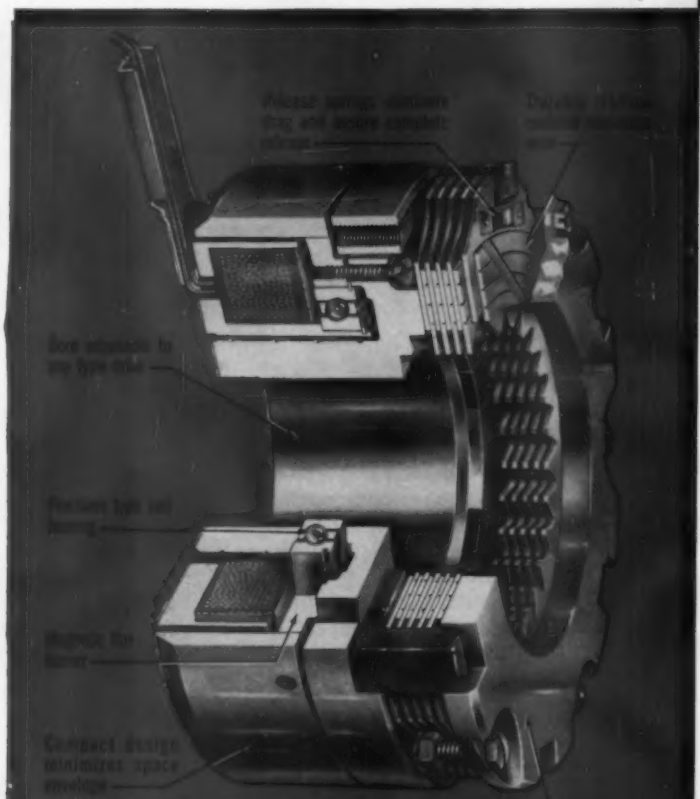

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INDUSTRIAL CLUTCHES AND BRAKES

Machine tools ... NEWS REPORT

Aircraft industry outlook ...

The recent aircraft industry cutbacks are having two widely contrasting effects on the machine tool industry.

First, the Defense Dept's new policy of "more pounds of hardware per labor hour, and more productive designs per engineering hour" ultimately will force a trend toward increasing use of automation in the aircraft industry. It's going to mean more numerical and tape control of machine tools, more use of electronic data processing, and "really modern tooling."

That's not an idle guess. It's the prediction of the man who is probably responsible for buying more capital goods than anyone in government —Lieutenant General C S Irvine, Deputy Chief for Materiel. General Irvine said it at a recent West Coast meeting on procurement. (See "Aircraft and Missiles," p111).

Because of the aircraft cutbacks and the Defense Dept's avowed intention to switch most military orders from aircraft to missiles within the next five years or so, that industry is in a general state of uncertainty.

With only hazy, highly generalized directives to go by, the aircraft people and their suppliers don't know what to order in the way of new machine tools and metalworking equipment for future production. This, in the first flush of near-panic that fell on airframe and engine makers when the cutbacks came without warning, resulted in many "hold up" orders, and in some cases outright cancellations.

In effect, the aircraft makers and their legion of suppliers are waiting for the green light from the Pentagon before they go ahead with their buying of capital goods.

At most, then, the cessation of orders from the aircraft industry is but a temporary one. When definite directives begin to come through from the Pentagon, when the "where do we go from here?" question has been settled, it is highly probable that orders for machine tools and metalworking equipment will pour in from the aircraft people in unprecedented numbers.

It's going to take a lot of machines to accomplish what is probably the most sweeping switchover that the aircraft industry has ever experienced. It won't be done overnight. And orders won't be coming through this month or the next—possibly not even this year—but when they do, they'll be big ones.

What about Detroit?

"We're sitting as tight as the bunghole on an acid drum waiting for machine tool orders from Detroit." This pithy comment from a machine tool builder just about sums up industry attitude.

To date, the only major commitment is from GMC Truck & Coach, which is readying a new engine. Otherwise, Detroit has kept mum about its capital goods buying plans. Even companies that have long been expected to announce plans for new engine lines, Buick and Oldsmobile to be precise, are silent.

General Motors reportedly had some substantial '59 quotes out, promptly pulled them back in without explanation. Since then, GM and other automakers have placed a few orders, but nothing to amount to much. Typical: proposals to re-gear existing machines to make intake manifolds of aluminum.

Machine tool builders in the Detroit area, whose business is geared primarily to the automotive industry, are somewhat concerned.

One anticipates making his first layoff since 1949, another reports that auto orders are off 40%.

Detroit's hesitancy certainly doesn't stem from an empty pocketbook. The Big Three, at least, have plenty of cash on hand. More likely, the automakers if anything are coasting a bit to amortize the tremendous plant investment they have built up in the last few years.

But there are only 60 days left before Detroit's silence over its capital spending plans becomes permanent—at least for '59 models.

Backlogs are still healthy ...

Despite Detroit's silence, and despite cancellations and holdbacks from the aircraft industry, machine tool industry backlogs continue to hold up well, with the lowest reported at around three months, the highest at one year.

One measuring stick for future machine tool business, sales of cutting tools, has been picking up nicely in recent weeks. If this continues, the outlook for an upswing in machine sales late this year and early next year is good.

Replacement is the keynote ...

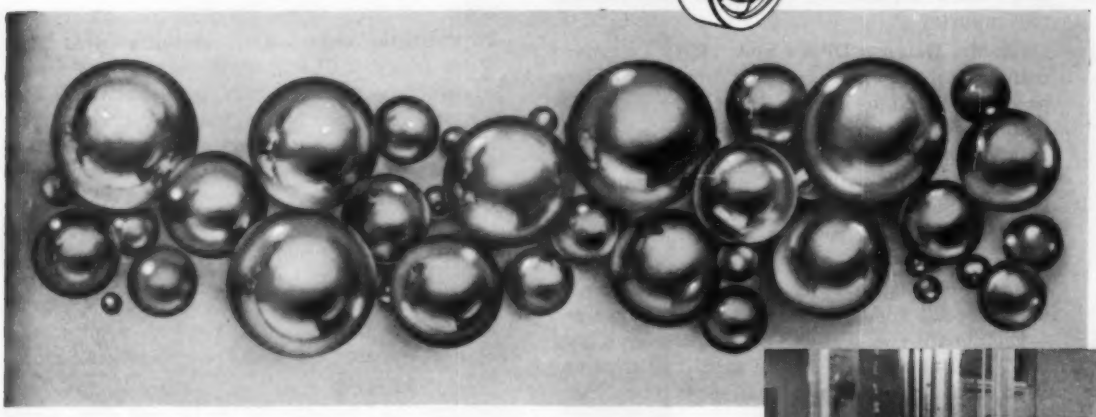
It is now pretty generally felt by the industry that replacement of machine tools, rather than expansion of facilities, will set the sales pace for several months to come.

One top machine tool builder reports that the average age of machine tools in use today is "shocking." He feels that increasing competition in all lines of metalworking will soon light a fire under company replacement programs.

FACTS

about

NEW DEPARTURE STEEL BALLS



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What's ahead ... in Metalworking

NEWS REPORT

Detroit is the big question mark . . .

Orders for steel from Detroit are continuing to fall short of expectations so far. Consequently, the anticipated rise in steel production has failed to materialize. The national steel production rate continues to remain at a fairly steady 83% of capacity, but output rate in the Cleveland area has been slipping for several weeks—from a high 89.4% to a low of 82%.

Nevertheless, top steel people are confident that the industry will wind up the year with total tonnage just short of 1955's record 117 million tons. And while new steel orders have been somewhat disappointing, mainly because of Detroit's failure to come through as predicted, industry heads are "puzzled rather than worried."

One reason advanced for the slowness in Detroit steel orders is that production schedules have been slowed because several automakers have gone much farther in changing their models than they expected to. Because some models slated for simple facelifting have been switched over to major changes, a major part of scheduled steel orders have been deferred until such time as production catches up with the changes.

Appliance outlook is good . . .

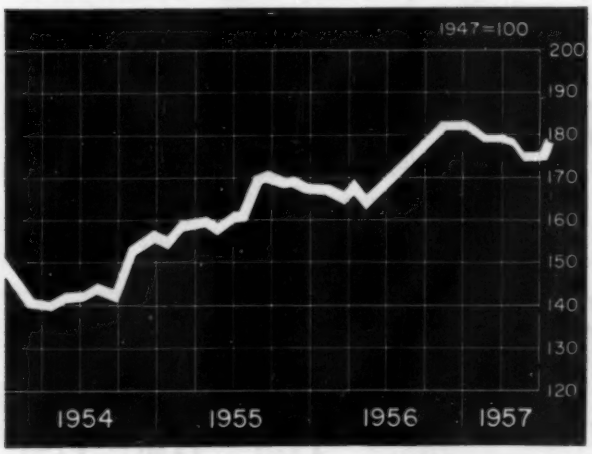
Appliance sales are reportedly higher at retail, wholesale and factory levels than they have been at any time this year. Practically everything is moving well, with weakest spots reported in automatic washers and dryers, and electric ranges. Orders are not only coming faster, they're bigger. But the industry has high inventory troubles, and it may take several weeks before increased sales show up in increased production.

Farm machinery improves steadily .

The steady improvement in farm implement sales that began in the second quarter continues. As of July 31, sales were lagging 7.5% behind the corresponding period in 1956—but sales over the summer ran some $10 million ahead of those last summer. It is now expected that sales for the year will run ahead of those for 1956.

Ti looks for a silver lining . . .

There's no getting around the fact that titanium producers are having tough sledding. For one thing, they can't seem to get prices down to the point where use of the metal is profitable in civilian products. And the government, slashing defense costs to the bone, is certainly looking twice at the $10-or-so-a-pound price of titanium. That means a lot of hard work on the part of the metal's producers—development of improved alloys, finding of ways to get the price down, and merchandising it to a wider market—before titanium comes into its own. Industry experts admit that mill product demand has dropped from 20-million lbs per year to 6-million lbs, and that it will drop in some future month to a low point of 250,000 lbs (that's an annual rate of 3-million lbs per year) before things get better. And from here, it looks like an upturn isn't due this year or next.



179

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	AUG. Estimated	JULY Preliminary	JUNE Revised	JULY Year Ago
Total Index	**179**	**178**	**177**	**170**
Machinery	153	151	153	
Electrical Machinery	217	210	209	
Autos	114	120	107	
Other Transportation	373	376	335	
Other Metalworking	148	145	138	

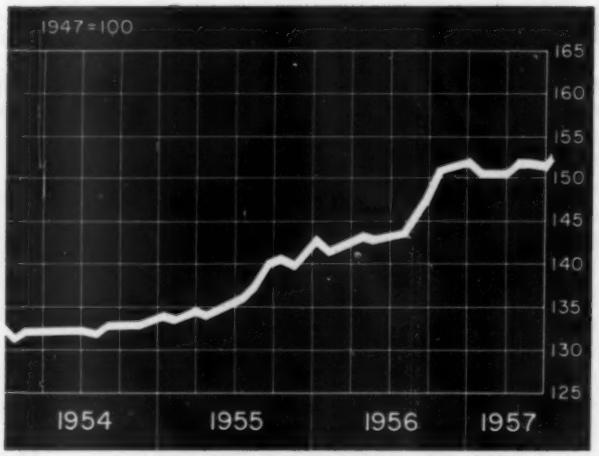
NEWS REPORT

What's ahead: . . . in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	AUG. Estimated	JULY Preliminary	JUNE Revised	JULY Year Ago
Total Index	**152.7**	**152.5**	**151.9**	**144.6**
Metalworking Machinery		**177.3**	**176.9**	**165.8**
Other Machinery exc. Electrical		**161.3**	**160.8**	**152.6**
Electrical Machinery		**155.0**	**154.3**	**143.0**
Fabricated Metal Products		**143.9**	**143.2**	**137.6**

152.7



Cutbacks are a drop in the economic bucket . . .

Despite all the publicity about defense cutbacks, the usual chicken-heartedness of the stock market, widespread complaints that profits are being squeezed, and there's no money around to expand a business or buy a house—despite all the gloom and doom boys—the public continues merrily on its way to the store, buying consumer goods at a great rate. All, that is, except appliances and autos, if we're to believe sales figures.

Fact is, retail sales have zoomed upward ever since April, after running along in neutral gear all through the first four months of 1957.

When you figure that consumers take two-thirds of everything this country produces, the recent widely publicized defense cutbacks assume a less important, and more rational, role in the nation's economy—total outlay for national security amounts to just one-tenth of Gross National Product, and the cutbacks account for only a small fraction of that one-tenth.

Actually, the facts behind government cutbacks in spending for guided missiles, planes, and military equipment are just now coming to light.

It seems as though government spending for such items was getting completely out of hand, soaring 'way over budget figures, when the Pentagon economy boys stepped into the picture.

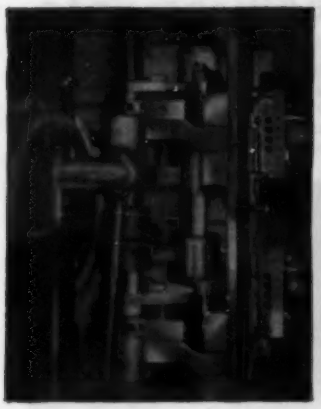
What, exactly, got the axe? Redundant projects mostly. Take the Army, for instance. It had six missiles of the same kind under development when the axe fell. The Navy had similar ones, too.

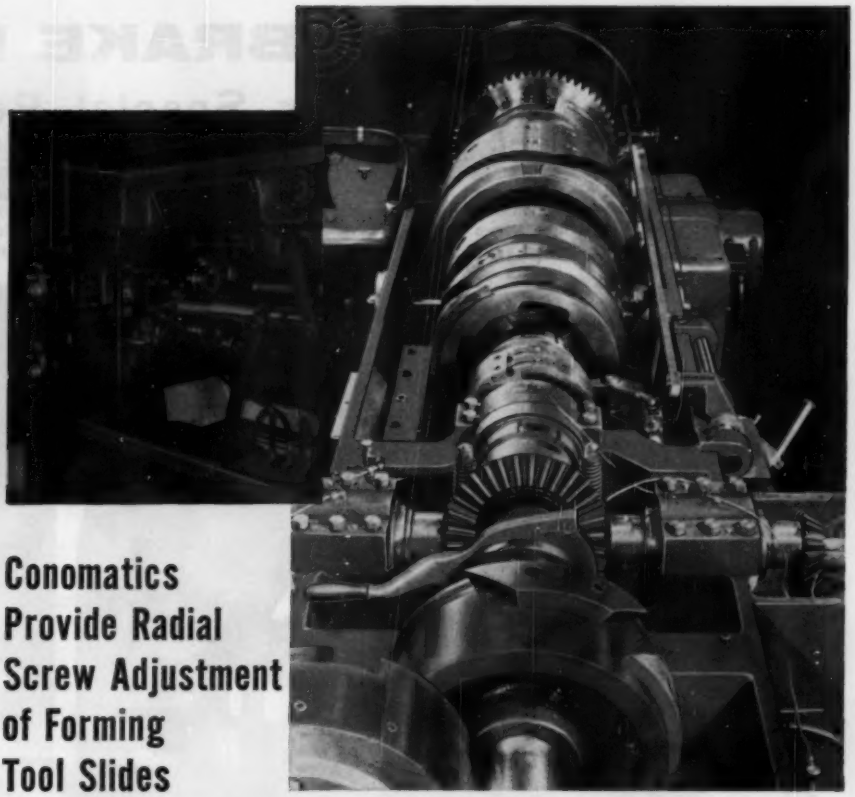
Added up, what do the defense cuts mean? Hardships to the plane and missile makers and their suppliers, certainly. Loss of jobs, probably only temporarily, to many of their workers. But to the U S budget it means an entry in black ink, and to the public it means one less obstacle in the way of a tax cut next year.

WEEKLY BUSINESS INDICATORS	*Latest Week*	*Preceding Week*	*Year Ago*
Business Week Index of Activity (1947-1949=100)*	144.9	145.4	146.6
Steel ingot operation (thousands of tons)	2,126	2,073	2,477
Electric power output (million Kilowatt hours)		12,147	10,955
Production of automobiles and trucks	110,354	142,982	66,618
Engineering construction awards (Eng. News-Record—millions)	$269.1	$314.1	$372.4

MONTHLY BUSINESS INDICATORS	*Latest Month*	*Preceding Month*	*Year Ago*
Index of industrial production (1947-1949=100)*	144	144	136
Index of durable manufactures production (1947-1949=100)*	162	162	148
Durable goods manufacturers' sales, millions*	$14,642	$14,207	$13,021
Machinery manufacturers' sales, millions*	$ 4,489	$ 4,259	$ 4,146
Durable goods manufacturers' new orders, millions	$13,069	$13,249	$14,087
Machinery manufacturers' new orders, millions	$ 3,972	$ 4,103	$ 4,289

* Seasonally adjusted.



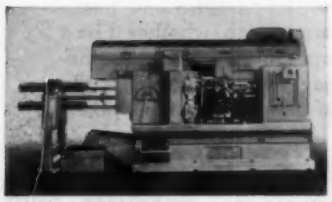


Conomatics Provide Radial Screw Adjustment of Forming Tool Slides

- Models 2⅝" LA, 3½" AD, 5" KL, and 5¼" KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

Another feature that is of considerable importance in tooling up is the radial screw adjustment of all sideworking slides. Trial cuts may be taken to correct diameters with form tools without changing the clamped positions of the form tool holders.

All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides. Besides the Four Spindle machines there are three quick change Six Spindle models in 9/16", 1" and 1⅝" sizes. Write, wire, or phone for literature.



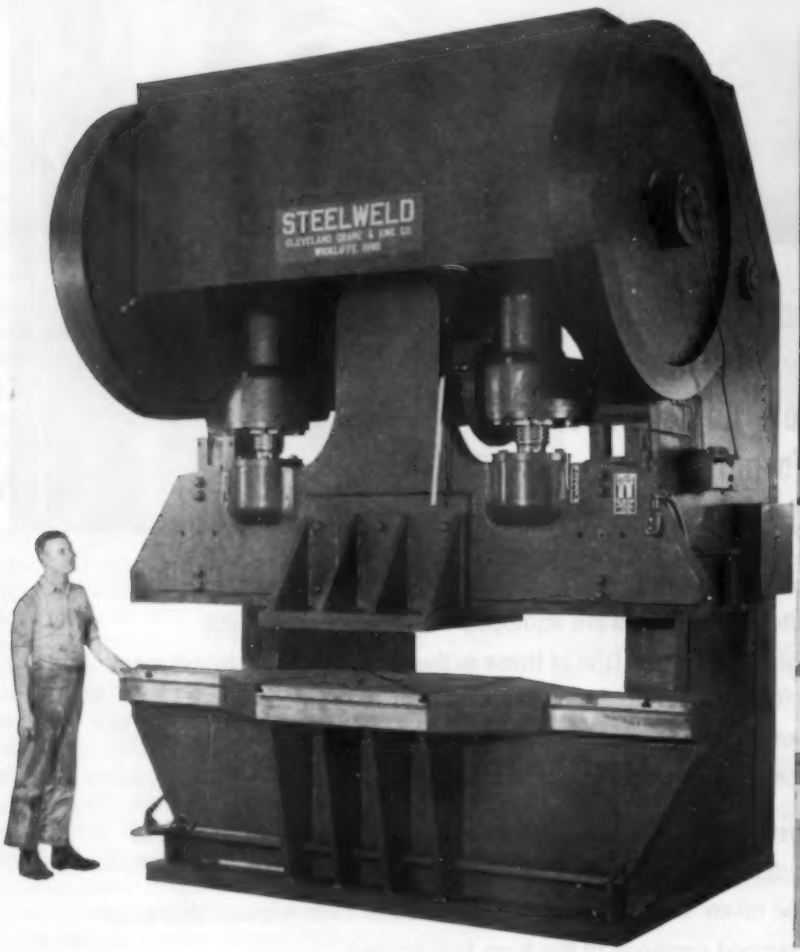
Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

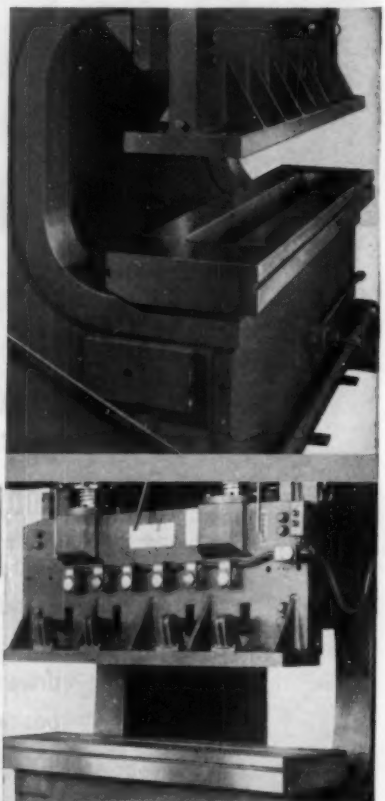
STEELWELD BRAKE DESIGN

Easily Adaptable For Special Requirements

Widening the bed of this 400 ton brake made it possible to serve a special purpose. The corresponding area of the ram was provided with a detachable ram bolster. With the bolster removed, normal brake operations can be carried on.



This Steelweld Brake was built with a double-plate bed having wide top and slot for punching purposes. This makes a low-cost press that is excellent within certain limits.



The bed of this machine has been widened and the ram extended in width at front and provided with die knock-outs. The electrical control was designed to permit two operators to work at the press with safety.

WHILE a standard press brake can handle a wide variety of metal-forming operations, often certain construction changes can be made that will permit doing work that normally would require a large costly forming press. Design changes can also be made that will speed production, improve safety or bring about other desirable advantages for specific types of work.

STEELWELD

PRESS BRAKES

Steelweld engineers have had a great deal of experience in tailoring press brakes to suit special jobs. Brakes have been built with many types of beds, with various shut heights, different speeds, unusual control arrangements, special gauges and safety devices, unique feeding equipment, etc. Because Steelweld's design is such as to make changes comparatively easy, the cost is reasonable.

For that next metal-forming job, whether it be a standard press brake operation or an out-of-the-ordinary one, it will pay you to investigate the possibilities of versatile Steelweld Press Brakes.

Write for free copy of Catalog No. 2010

STEELWELD DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. 1465 EAST 281 ST. • WICKLIFFE, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

No Job More Important

Nothing short of a revolution is taking place in the composition of our labor force.

Time was when the military services and industry were seeking brawn. But the twilight of that day is here.

Ground troops won't play the part in the next war that they have in past wars. Pentagon is now demanding that the level of intelligence be raised to a point at which a recruit can be taught to operate modern complicated weapons. War will be mechanically complex, not simple.

Mere muscle power . . .

will not play the part in manufacture of metal goods—or in many other industries—that it has in past years. As mechanized production takes over, unskilled workers will be less and less a factor. Large groups of skilled and semiskilled workers will replace them.

The trend in all fields is toward greater skills, a recent U S Department of Labor study of "Our Manpower Future" reports. Based on a continuation of basic trends that operated in the first half of this century, the study predicts startling changes will occur between now and 1965.

An increase of one-third . . .

or more is anticipated in professional and technical ranks—scientists, engineers, teachers, physicians and nurses. A gain of more than one-fifth is expected among proprietors and managers.

Craftsmen and operators who man our factories and who construct our homes, roads and buildings will expand their forces by one-quarter. As the population grows and people have more money to spend, clerical and sales workers and service workers in general will be needed in rapidly growing numbers.

Unskilled jobs, in sharp contrast, will decline. Nontrained manpower, and even men with limited training, will be required in far fewer places than they are today.

If the government's study accurately forecasts what 1965's needs will be, our expanding economy will call for employment of 74 million people. That will be a notable gain over the 63 million employed in 1955.

We will need not only more workers, but better educated and better trained workers.

It means that in the years immediately ahead a great responsibility for educating and training men and women will rest upon our trade and vocational schools and upon our community colleges and universities.

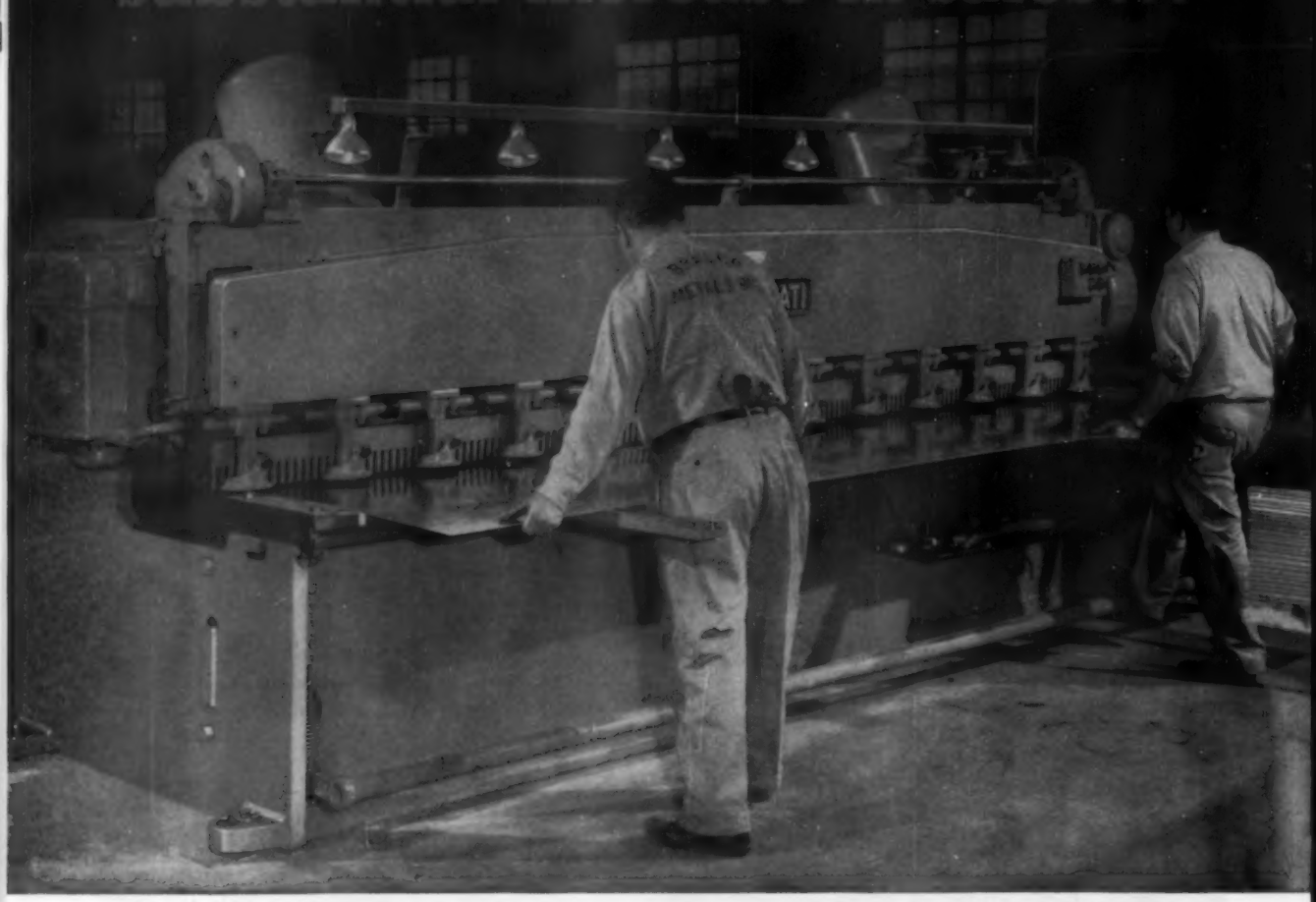
An equal responsibility will rest . . .

upon industry to give its financial and moral support to our educational institutions in this terribly important endeavor.

What could be more disastrous for America than to come hard up against its manpower requirements and not be able to meet them. On the other hand, what could be a greater stimulus to prosperity and a stable economy than to be able to fill our manpower needs as they arise with well-educated and well-trained men competent to carry out the work assigned them.

Burnham Finney EDITOR

Accurate CINCINNATI SHEAR brings substantial increase in sales...



at BRALCO METALS, INC., Los Angeles, California

Micrometer accuracy in squaring, notching and slitting of aluminum sheet and plate makes this Cincinnati Shear a profitable producer. The Bralco Company states, "There is no question that this Shear has been responsible for a substantional increase in our sales." Maintained accuracy is insured by hydraulic holddowns, low rake upper knife, inclined ram and all-steel, weld free construction.

The 1412 Series Cincinnati Shear is shown shearing aluminum sheet. High pressure hydraulic holddowns automatically clamp different gauges of metal with the same pressure.

Write **Department A** for Shear Catalog S-7R. We also suggest that you contact our Application Engineering Department for information on your shearing problems.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS · SHEARS · PRESS BRAKES

American Machinist

TEST RESULTS . . .
on forming titanium extrusions

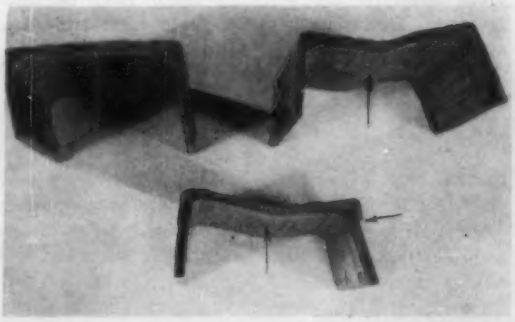
Stretch-wrapping, joggling (double offset bending), and degreeing (simple bending to specific angle) operations were carried out on titanium extrusions (6AL-4V and A110AT) to see how shaped stock acted, if differently from Ti sheet. Though these evaluations are incomplete, they show how touchy titanium can be if not handled with kid gloves

I J WILSON, design specialist, NORTH AMERICAN AVIATION, INC, LOS ANGELES

Practically all extrusions for high-speed aircraft, whether for build-up structures or for sandwich assemblies, must go through forming operations. One of the most troublesome factors in forming titanium extrusions has been the condition of the as-extruded surfaces, which is sometimes good, sometimes poor. Die marks such as grooves and ridges vary a great deal, even on the same part:

These marks greatly affect bending action in a direction parallel to the marks because titanium is notch-sensitive and cracks may easily start in the grooves. Actually, almost any degree of bend will produce cracks (top of next column).

Another contributor to cracking is the oxide scale, which may penetrate the metal to varying depths. It may be removed by sandblasting, machining, or pickling; at North American the machining approach is preferred at present. All extrusions are designed with an allowance of 1/16 in. of material on each side, which is machined off prior to forming operations. This is no real solution to the problem, but simply a stop-gap method until extrusion suppliers can improve quality control.



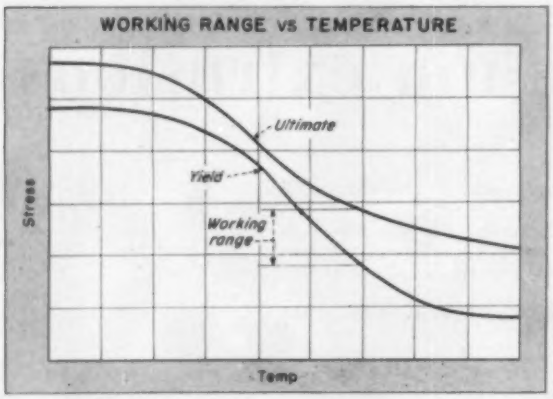
Machining costs about $4/ft of extrusion for a simple shape with six sides. This is not only costly and time-consuming, but also creates further problems that affect formability in some cases. There are sometimes inclusions and rough spots inside the metal, and the extrusion may warp after machining. Warpage is not a serious problem, however, if the extrusion is to be stretch-formed.

PLEASE TURN PAGE ▶

TEST RESULTS . . . on forming titanium extrusions

WRAPPING

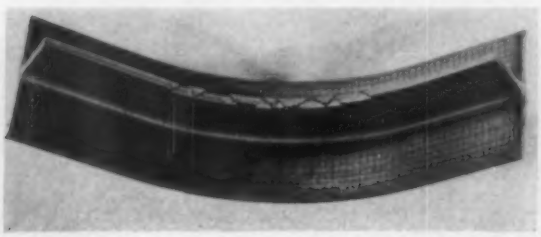
A useful method of testing the forming limits of a material is to stretch-wrap a T-section, of which the inner side will be compressed or shrunk and the outer side stretched. One of the problems with titanium is the relatively narrow formability range, between the yield strength and the ultimate. A further complication is the fact that the range decreases as temperature rises, up to a temperature of about 1250 F, where the range again expands:



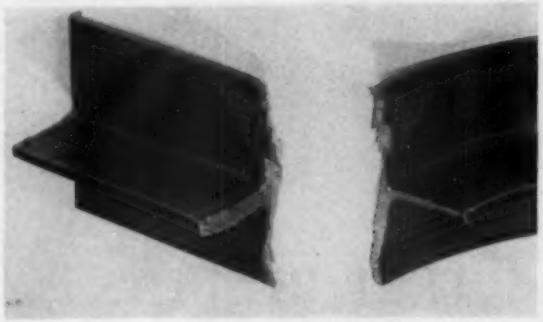
If the material has to be heated to bring down the yield strength, the working range may be limited severely. Common practice is to heat titanium to around 700 F, at which point the working range is narrow. Further research on this point is being conducted.

Rough operating rules, however, have been established. At room temperature, stretch should not exceed 18% and shrink should not go over 8%—but only for extrusions with all surfaces machined. These ratios can be shifted various ways; for example, stretch can be 20% if shrink is limited to 4%, or shrink can rise to 10% if stretch is limited to 8%. These figures are only good for rough comparisons, because they apply to a specific shape and a specific bend radius.

When a titanium extrusion is stretched beyond its limit, the material cracks, much like glass:



Splinters actually fly off in some cases. But if the stretch is increased to reduce compression inside the bend, the result is often two pieces where there was originally only one (top of next column).



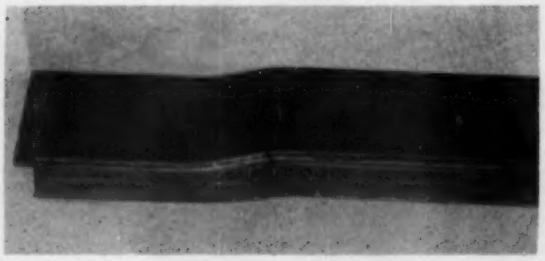
This break, which includes almost no necking down, shows that titanium has considerable resistance to forming operations. Rate of forming has little effect up to a point, but at high-speed forming rates the yield increases, which narrows the forming range even more severely.

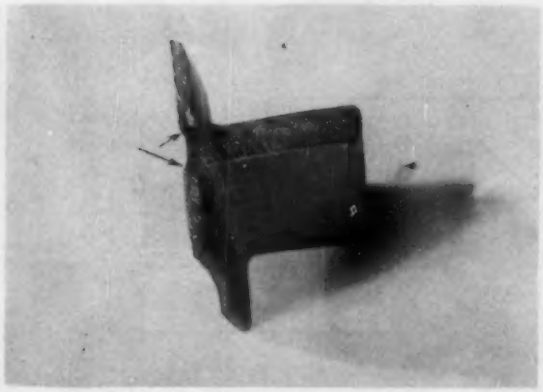
However, titanium extrusions *can* be successfully formed. This example was formed after machining, which helped formability considerably:

JOGGLING

Run-out in a joggle is a function of the minimum bend and the ability of the material to flow in the run-out area. Surface condition is also important here, as this fractured joggle indicates (below).

This part was not machined, although machining is no guarantee of perfect joggles.





Another kind of fracture, which split the work apart, developed in a T-section because the heavy part of the T resisted bending, and the flanges pulled away. One important rule, therefore, is to apply heavy tooling that will prevent differential bending. A rough measure for safety is to hold the part for a length of five times the depth of joggle. Heat has no important value except to reduce the horsepower demanded of the machine.

Good joggles, too, can be made if the rules are followed and the material is not pushed too hard:

These points are important:

1. Maintain good surface condition
2. Form at room temperature, or above 1250 F
3. Follow limiting shrink and stretch allowances
4. Make bend radii generous
5. Apply good tooling

Under these conditions, even though titanium extrusions can be considered difficult workpieces, successful bends and joggles can be made.

Expandable jaws speed turning operation

As told to BEN C BROSHEER, associate editor,
by JOHN B KLASSEN, general manager,
LA PORTE WORKS, TRACTOR GROUP, ALLIS-CHALMERS MFG CO

The first operation on the intermediate suspension arms of the Marine Corps' "Ontos" tracklaying vehicle (*AM*—Aug 26 '57, p108) consists of turning the OD of the main support bearing. These heavy cast-steel parts are machined on a 42-in. King sidehead boring mill.

To facilitate loading and unloading, the workpiece is supported by expandable jaws in centering heads on the table and turret of the boring mill. Centering on a long, one-piece fixture spindle would have been time-consuming.

The spindle of the upper centering head is mounted in three sets of heavy-duty, precision ball bearings to withstand side thrust during roughing operations. The lower head is welded to a baseplate bolted to the machine table.

Each head has three jaws made from AISI 8645 steel, heat-treated for toughness. A single jackscrew controls the position of all three jaws through wedges which are made from hardened drill rod and ground all over.

In each assembly, when the jackscrew pressure is released, heavy compression springs return the wedges, permitting garter springs to withdraw the jaws and release the workpiece.

Workpiece is positioned . . .
on lower centering head. Upper head is lowered into part by ram. Then jackscrews are turned by wrench to expand jaws against ID of piece. Clamp assembly at left locates and holds extension of part

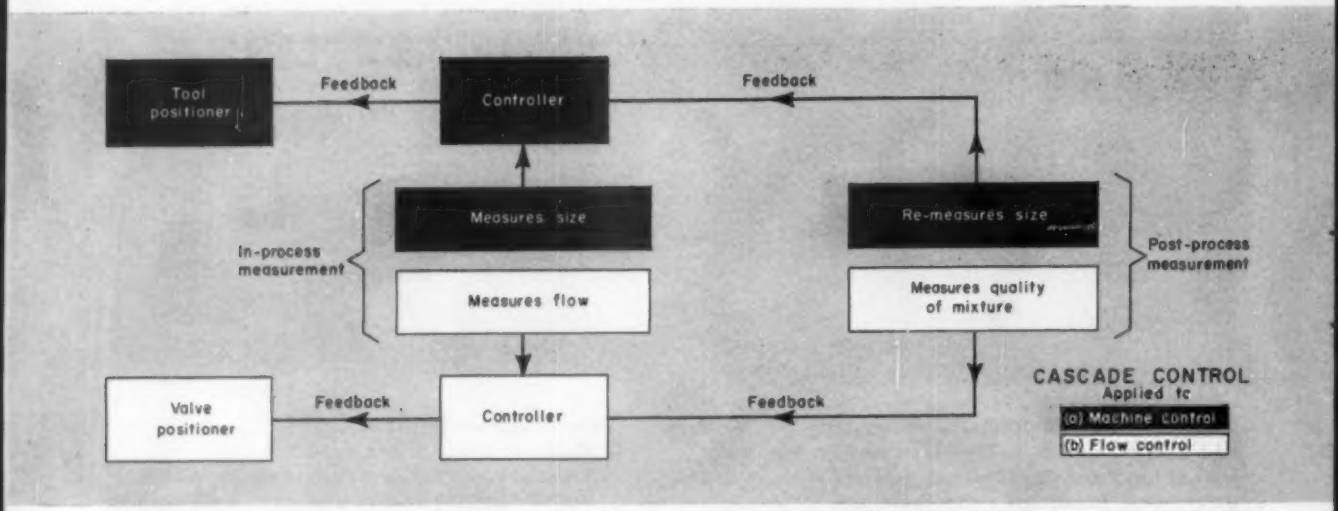


Fig. 1 . . . Comparative systems . . . as applied to a metalworking and a chemical process, show identical elements. "Cascade control" provides integration of automatic sizing and post-process measurement, through feedback, to maintain desired quality level. This is the basic self-resetting system

Ideas from process industries

ROBERT JOHNSTON, application engineer
MOORE PRODUCTS CO, PHILADELPHIA

Instrumentation added to the combination of machine tools and gages provides the complete automation package. There is a proved body of concepts and equipment applied to automatic chemical processes which, without major change, can be applied to automate metalworking processes. Cascade control will maintain a desired quality level, even on general-purpose equipment. Here are the tools—we need only learn to use them

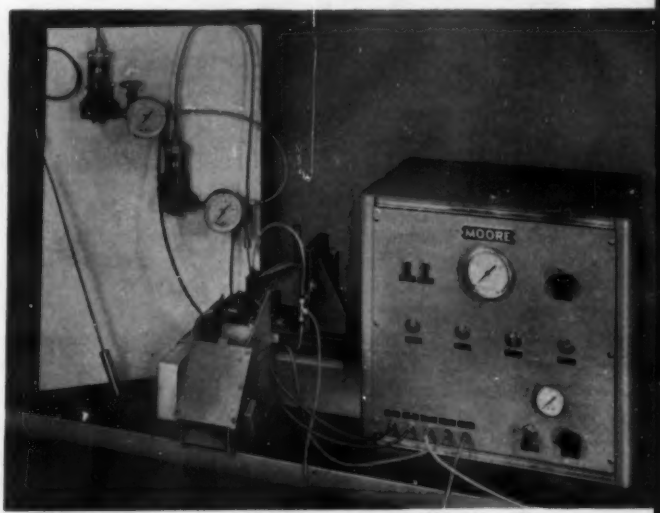


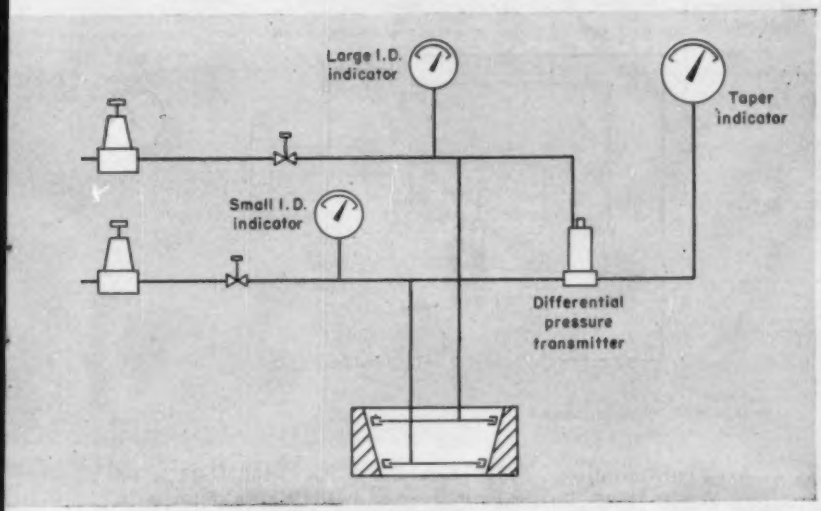
Fig. 2 . . . Post-process portion . . . of a cascade system before installation on a centerless grinder. Part is gaged as it leaves grinder and correction is fed to in-process gage

Although "automation" is comparatively new in metalworking, men in the chemical and allied fields have known and used this concept for many years to manufacture, automatically, such things as chemicals, gasoline, soap, and plastics. At first glance, it appears that the knowledge gained by chemical-plant men, and the equipment they have developed, is of little value in automating a machine tool. Mixing a batch of chemicals may not seem to have much in common with controlling the size of a crankpin or a bearing race.

Surprisingly, however, these operations have so much in common that we can lift (almost without change) the theories, circuits, and gadgets which the chemists use—and apply them to make a machine tool turn out parts automatically! Thus the machine tool industry, instead of spending years painfully developing suitable automatic controls, can turn to "industrial instrumentation," or "process control," and find the majority of these controls immediately available.

The strong similarity between machine-tool control and chemical-process control is apparent:

For machine-tool control, an in-process gage has



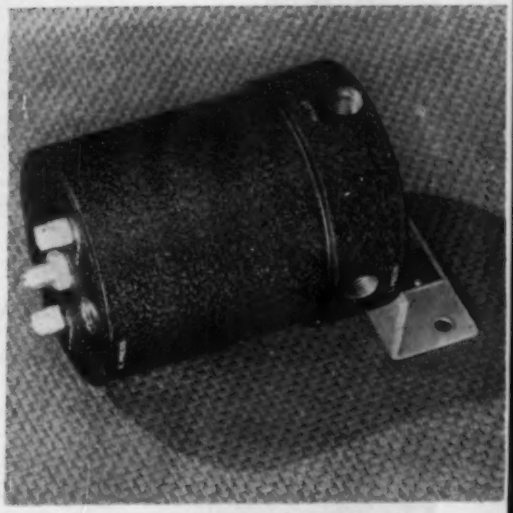


Fig. 3 . . . Taper gaging circuit . . . is based on a differential pressure transmitter. Large and small inside diameters are individually air gaged; then readings are fed to transmitter which reads out at taper indicator. Read-out can, in turn, be fed directly to machine control

aid automation

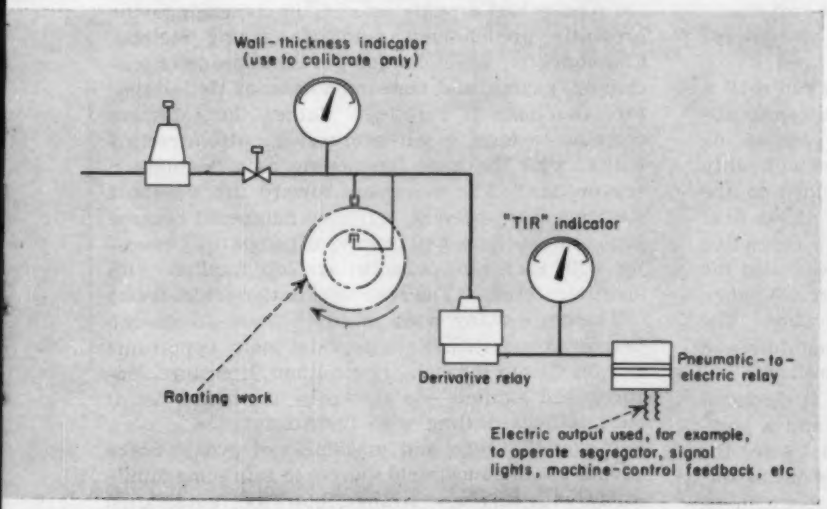

Wall-thickness indicator (use to calibrate only)
"TIR" indicator
Rotating work
Derivative relay
Pneumatic-to-electric relay
Electric output used, for example, to operate segregator, signal lights, machine-control feedback, etc

Fig. 4 . . . Automatic gage for concentricity . . . uses a "derivative relay" which produces an output that varies with the rate of change in input (gage pressure). Because the degree of eccentricity of work determines the rate of change, the pneumatic-electric relay "fires" when tolerance of total indicator reading is exceeded

difficulty in measuring as accurately as does a post-process device. Inaccuracies can result from coolant, chips or grinding grit, and because the gage is measuring a rotating part "on-the-fly" as it is reaching final size. A post-process gage has none of these disadvantages. However, its greater potential loses significance as, unlike the in-process gage, it is measuring parts already machined. Thus, if scrap is detected, the gage can do no more than prevent further scrap by interrupting production until the machine is reset. Neither system offers optimum control.

In industrial instrumentation, we find a similar problem, and, more to the point, its solution. When two chemicals are flowing into a vat, instruments (process controllers) control the rate of flow of the two fluids so that they will be mixed in the proper proportion. However, because of adverse conditions (such as temperature and pressure variations—similar to the coolant, grit, and dynamics in the gaging

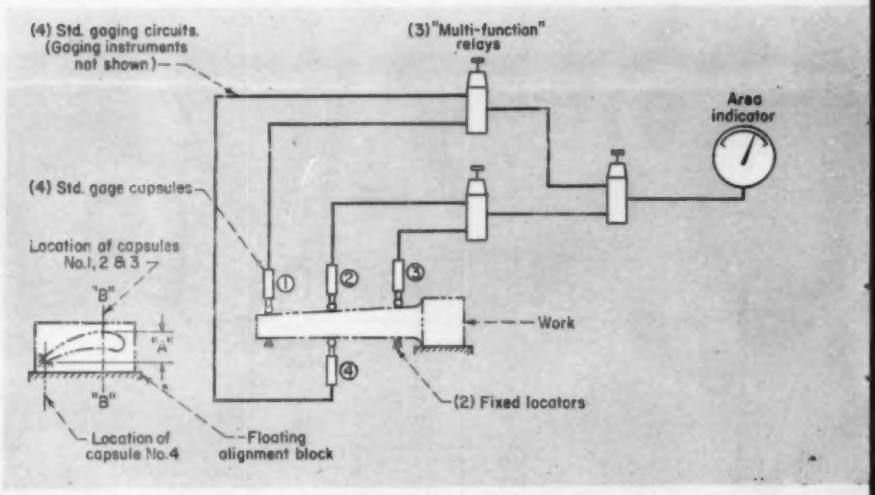


Fig. 5 . . . Area computation . . . for pieces such as this turbine blade, is done with a multi-function relay circuit. Because the influence on area of a given change in "A" dimension differs at each of three measuring sections, the gaging values must be added together in a "weighted" manner. A different magnification is assigned to each gaging circuit. Then, the multi-function relays add the gaging pressure directly.

Final output of the system shows the area in plane "B-B" of a shape bounded by the "A" dimensions and the overall length of the airfoil. Overall length can be assumed constant (as in the system shown) or entered into the computation via a fifth circuit to measure length plus a fourth multi-function relay to receive it. Circuit No. 4 merely compensates circuit No. 2 for possible "bowing" of the blade.

problem), the fluids being mixed are off-specification, even though the quantity flow of the two chemicals is controlled at exactly the right amount required for the desired product.

The time-proved solution is "cascade control," a concept commonly applied to such problems to obtain the highest product quality. In this case, an instrument which can analyze the final product quality (called the "primary controller") is added to the control circuit. It measures the quality of the final product—and continuously feeds back a corrective signal to reset one of the flow controllers (called the "secondary controller" in a cascade circuit) when the product threatens to go off-specification. The product-quality controller, therefore, monitors and refines the performance of the flow controllers.

To apply this "cascade" concept to a size-control problem we install both an in-process and a post-process gage and interconnect them so that when the post-gage finds the work size wandering out of tolerance, it feeds back a corrective signal which, in effect, recalibrates the in-process gage according to the severity of the adverse conditions current. The identical basic nature of these two cascade circuits is shown schematically in Figure 1.

All of the instruments required to assemble these circuits are standard with instrument people—and are used by the thousands.

There are numerous other instances in which instruments developed for "process control" can be used without alteration to measure metal pieces and to control the machines that produce them. Instruments for flow, pressure, temperature, liquid-level, and other process variables are available. Among the most frequently used are those shown.

These instruments are largely pneumatic, hence are readily tied directly into pneumatic gaging—the presently predominant automatic-gaging method. Consequently, as automation grows, thinking of machining, gaging, and instrumentation as three separate functions is pointless. Rather the functions combine to form a self-monitoring, self-correcting entity, with the gage functioning as a "dimension transmitter." The movement toward this desirable situation is, at present, seriously hampered because gage and machine-tool people, although fully familiar with each other's work, are less familiar with instrumentation. (The reverse situation is also true.)

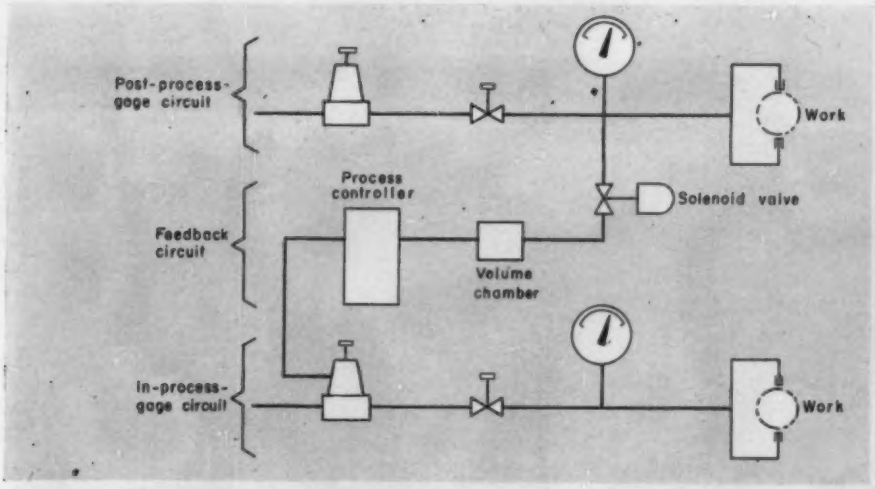
There are many ways in which these groups can become acquainted. Each provides many opportunities for liaison through organizations, literature, lectures, and exhibits—as shown by the boxed list of such sources dealing with instrumentation.

If we, the gage and machine-tool group, make proper use of educational sources to gain some familiarity with this now strange, but vital, automation tool—and there is a similar opposite response—automation in the metal-manufacturing field can "skip a generation."

SOURCES OF INSTRUMENTATION INFORMATION:

Organizations: **The principal body is the Instrument Society of America. This group has chapters in all areas of the country. The central office is 313 Sixth Avenue, Pittsburgh 22, Pa.**

Literature: **All instrument manufacturers, of course, provide catalogs and papers. Information on new equipment and developments will be found in periodicals—such as American Machinist, *Control Engineering, I S A Journal, Automatic Control, Instruments and Automation,* and *Automation.* Typical text-books on instrumentation include:**



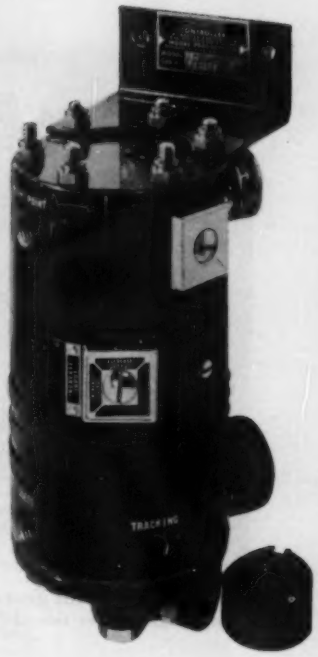


Fig. 6 . . . Heart of feedback . . . portion of cascade circuit, for self-resetting, is process controller. Post-process gaging signals, one per piece, are pulsed into the volume chamber through the solenoid valve, which opens, momentarily, once each gaging cycle. Thus, a sustained change in work size will cause a significant change in chamber pressure, while a momentary change in pulse value will not markedly change chamber pressure. Therefore, the system responds only to a true trend in size change—and not to an occasional "freak."

Output of the process controller changes in proportion to changes in the volume chamber. This output is the air-loading on the in-process-gaging pressure regulator. A change in loading results in a proportional change in regulator output. This change, in turn, brings the in-process gage circuit into agreement with the post-process gage. The ratio between input and output change (proportional band) in the controller is adjustable and permits "trimming" the system to provide the proper degree of in-process "zero shift" in response to the feedback signal

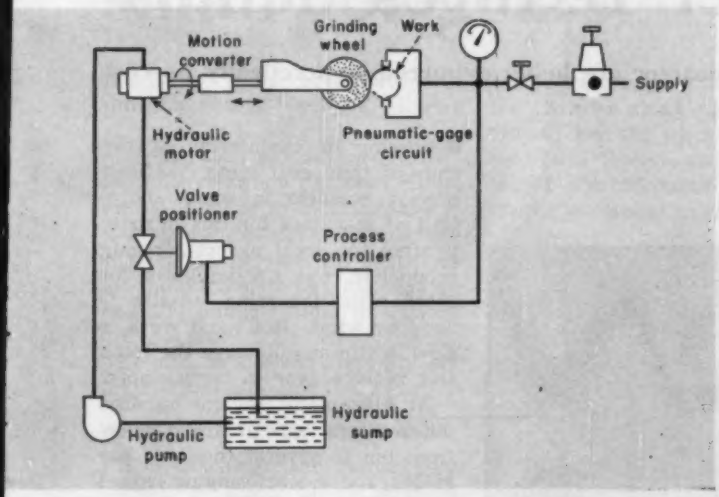


Fig. 7 . . . Plunge grinding rate-of-feed . . . control circuit is built around standard valve positioner. Internal control is hydraulic while gage circuitry is pneumatic. From "start" to finish grind, the system operates to reduce the feed rate exponentially in response to the changing gaging signal

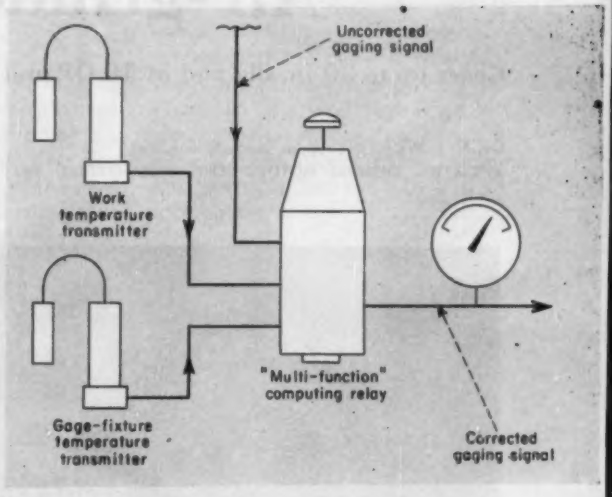
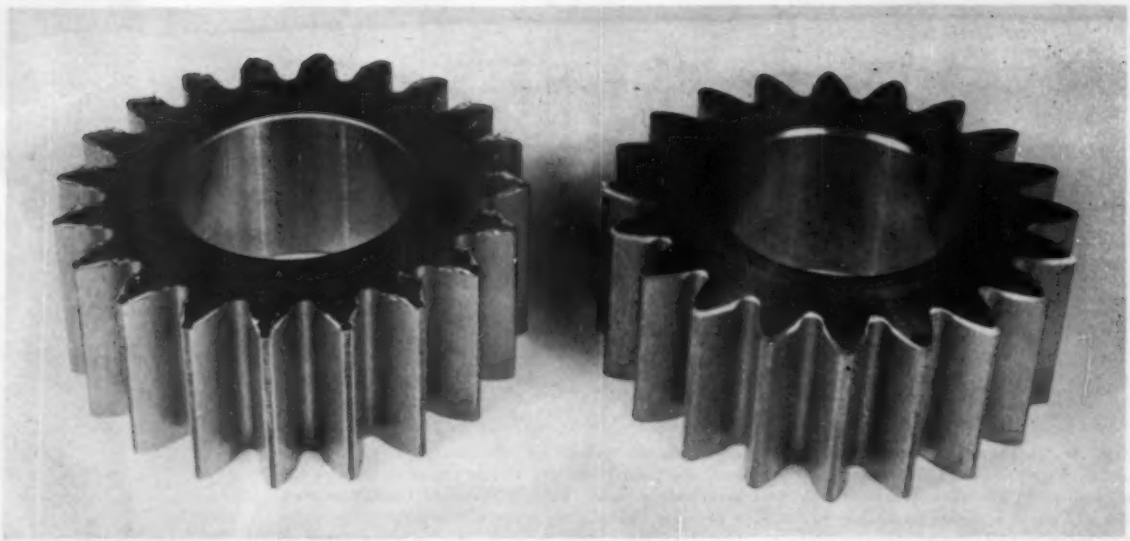


Fig. 8 . . . Temperature compensation . . . for difference between gage, fixture, and/or machine-tool temperature and work temperature is provided by transmitters reading into a multi-function computing relay which also receives the uncorrected gaging signal. Compensated signal is fed to indicator and to machine control

1. Industrial Instruments for Measurements and Control by T J Rhodes (McGraw-Hill)
2. Principles of Industrial Process Control by D P Eckman (Wiley)
3. Automatic Process Control by Norman H Ceaglske (Wiley)
4. Industrial Instrumentation by D P Eckman (Wiley)
5. Instruments for Measurement and Control by Werner G Holzbock (Reinhold)
6. Industrial Automatic Control by Millard H LaJoy (Prentice Hall)
7. Fundamentals of Automatic Control by G H Farrington (Wiley)

Lectures and Exhibits: The I S A and many manufacturers maintain staffs of lecturers available to visit plants or groups. Exhibit rooms exist in the plants of many instrument makers—who are happy to perform working demonstrations for visitors. Periodic general exhibits are held by various groups. (The ISA will supply details.)

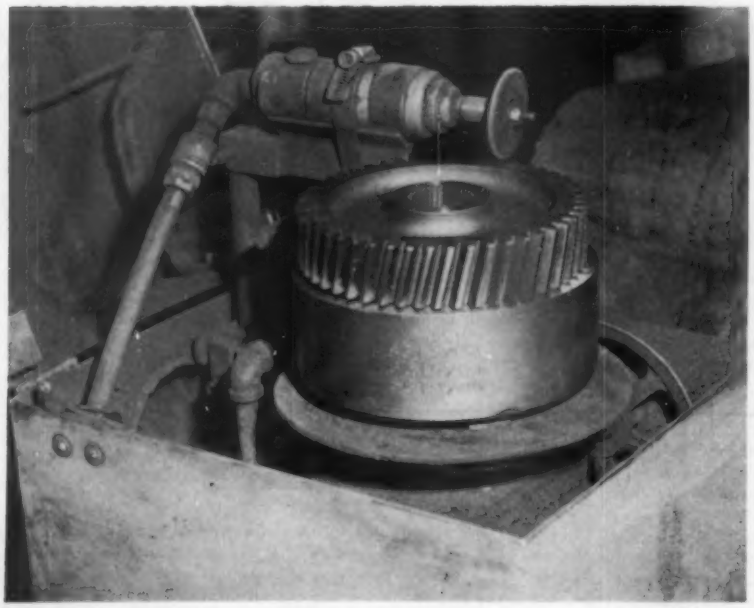


Burrs on small-lot gears are costly to remove by hand grinding. Machine chamfering in 12 sec. per side can be done with a shop-made air grinder setup

Air-grinder fixtures deburr

Gears up to 30 in. dia and of 10 DP and coarser are being deburred at practically no cost

DICK J WEAVER, senior methods engineer,
Allison Div, GENERAL MOTORS CORP, INDIANAPOLIS, IND



Small gears are placed on turntable. Wheel of pivoted air grinder rests on tooth end, works up and down around profile as gear slowly turns

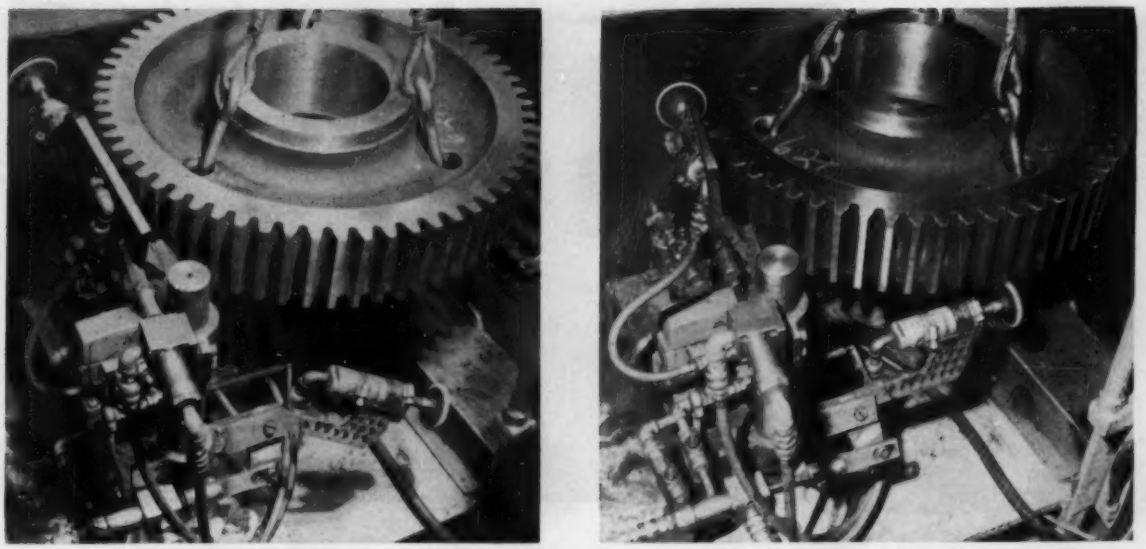
Deburring or chamfering of the ends of spur gear teeth has long been a problem in many shops. Cost of machines for this purpose is often too great except for long production runs. Consequently, for short runs deburring usually is done by hand. But hand work is slow; a slip may damage the tooth and require gear to be scrapped.

At Allison Div, several hundred different gears are produced in lots from ten to several thousand per month, and in sizes ranging from 1 to 30 in. dia.

To reduce costs, the Manufacturing Methods Department undertook development of simple, low-cost machines to deburr small spur gears of 10 DP or larger.

Early tests showed that the grinding wheels would leave fine burrs varying with the work hardness and wheel grit. However, if deburring is done immediately after hobbing, the grinding burrs disappear in subsequent shaving, grinding or heat treatment.

Use of the homemade machines has improved gear quality. In



Two air grinders work simultaneously on opposite sides of large gears. Grinders swing out of way to load gear on turntable (left). In operation of the setup (right), the upper grinding wheel rests on tooth edge by gravity; the lower wheel is held in contact with opposite edge by a tension spring to pivoting fixture

small lot gears

nearly every case they machine a uniform "break" without missing any area. On some gears, where chipping occurred during hardening, this condition has been eliminated. Damage to tooth profiles is a thing of the past. Cost savings are substantial, because the machines are automatic except for loading and unloading. These operations are performed by the operators who also handle hobbing or shaving machines.

WHEEL "FLOATS" ON TOOTH EDGE

The machines are remarkably simple. A small air grinder is mounted so that it can pivot about a horizontal hinge pin passing through a vertical support at the back of a box-like inclosure. Radial adjustment of the grinder is such that the wheel periphery rests on the end face of the gear teeth. In effect, the wheel "floats" except for the restraining action of the hinge pin and of the wheel resting against the ends of the gear teeth. As the gear is revolved, the grinder and its wheel rock up and down.

At the tip of each tooth, the wheel is in its uppermost position but, as the tooth revolves, the wheel lowers by gravity, making the chamfer along the tooth contour. When the wheel reaches the root, the lowest position is attained. Further motion of the gear causes the wheel to rise slowly as the chamfer is made along the edge of the next tooth.

These motions are automatic. Vertical motions result from the combined climbing action of the wheel, gravity, and the reaction from gear motion. The chamfer is comparatively regular, although it narrows slightly at each side of the root. There is a change in the angle of the chamfer from root to tip but burr removal is complete.

Before starting a small machine, the operator centers the gear on the turntable, where the work is held only by its own weight. When a button is pressed, the turntable and gear start to rotate and an air cylinder lowers the grinder until the wheel rides freely on the gear. An automatic timer stops the machine and elevates the grinder at the end of a given time interval, usually after either one or two gear revolutions.

For gears under 8-in. dia, the time cycle per side is about 12 sec. After the cycle ends, the gear is turned over (except for large machines) and the cycle is repeated. Small machines use a 3 x ⅛-in. wheel, 80 grit, and run at 15,000 rpm. Turntable speed is about 9 rpm. Wheels have a nylon binder and generally last for 3 to 4 hr of normal use.

TWO GRINDERS FOR LARGER GEARS

Locomotive gears of up to 30-in. dia are chamfered on both sides in about 75 sec on a larger machine. This is made possible by using two air grinders simultaneously. Air cylinders raise and lower the grinders. Contact of the upper grinder is by gravity only and that of the lower grinder is controlled by spring pressure.

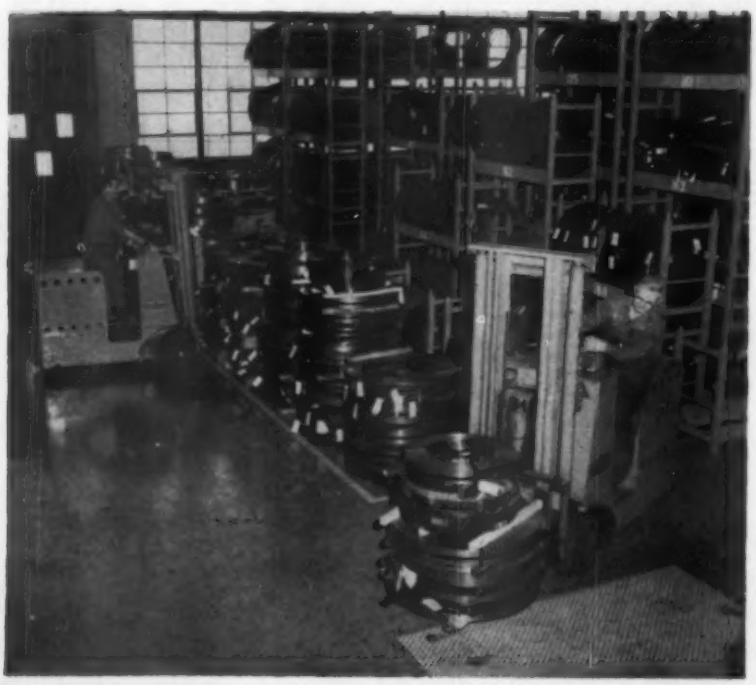
Both grinders are pivoted at an angle of 35° to the vertical and away from the gear, there being no radial movement. Motion at an angle not only makes top loading possible but also allows the use of a smaller wheel where large tooth depths create a problem. With angular mounting, the chamfer angle from tip to root is more nearly constant. Grinders are moved outward at an angle when the gear is loaded.

Only simple changes are required to adapt the machines to changes in size and pitch of gears.

Incoming freight cars . . .
are unloaded by electric fork-lift trucks at the Barnes-Gibson-Raymond Div of Associated Spring Corp. Spring-steel coils, from which precision springs will be made, are received on pallets that reduce over-all handling problem. Boxcars carry about 100,000 lb of spring steel

Industrial-truck fleet simplifies...

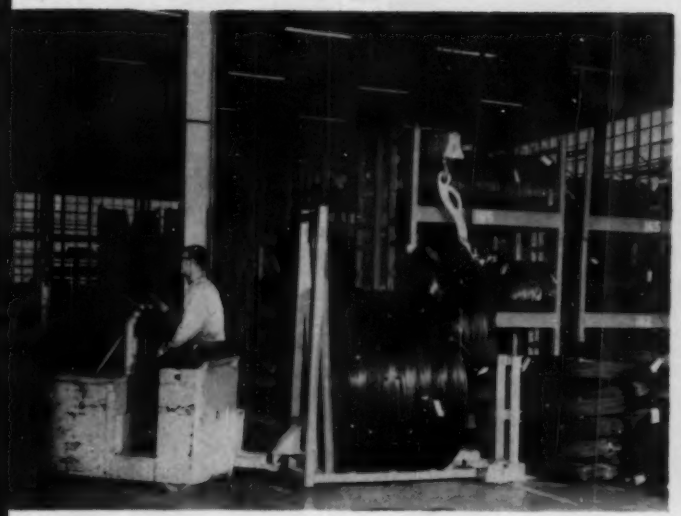
Coil handling from receiving to shipping



Incoming steel coils . . .
are stacked horizontally, one coil atop another, so that they retain their round shape. Round-wire rolls, received at plant from motor highway trucks and transported to storage area on electric truck forks, are placed in sectional bins that can be moved throughout the storage area by overhead cranes

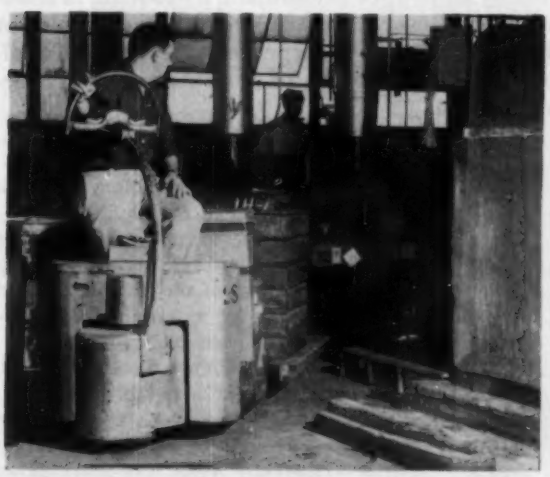
Handling heavy, bulky materials is often impractical if not impossible to reduce to the pushbutton controls we call automation. Such hard-to-handle objects as heavy steel coils can be moved through a variety of operations by industrial trucks, which offer flexibility, ruggedness, and low operating cost. It's hard to see how the job described below could be better done—hard, indeed, to imagine its being done any other way

A fleet of ten industrial electric trucks handles all materials, from the time they are received until finished products are shipped, at the recently built Plymouth, Mich plant of the Barnes-Gibson-Raymond Div of Associated Spring Corp. B-G-R, which produces all types of precision mechanical springs, utilizes several types of electric trucks—all of them built by Lewis-Shepard Products, Inc—to handle the spring-steel coils and round-wire rolls from which its



Overhead crane . . .
and electric tractor work together to move round wire to production area. Specially built trailer can handle 6000 lb of wire. In background are smaller rolls of wire, which are stored in bins according to size. These bins can be removed by overhead crane

Double-duty fork truck . . .
carries spring-steel coils right on the adjustable forks, with the forks serving as a ram. Coils are placed directly on the slitting machine for slitting and filing



In-process materials . . .
are carried through various production stages in small rectangular boxes. Company uses three trucks, which carry pallets or skids, for in-process handling

Palletized loads . . .
are placed directly into outgoing motor trucks with Lewis-Shepard Jackstacker, reducing handling time considerably

springs are fabricated. Coils are received at an indoor railroad siding; round wire comes into the plant via motor highway trucks.

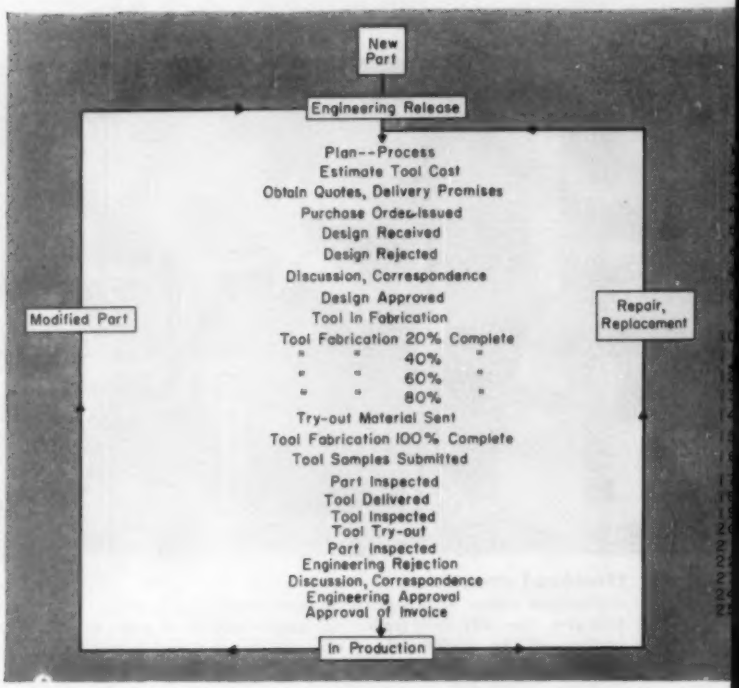
Handling operations include removal of coils from freight cars, weighing and storing, moving to production area, handling through various production operations, and carrying finished products to the packaging department. Accompanying photographs show how these handling operations are performed.

Company reports that its extensive use of industrial trucks has increased warehouse handling efficiency and reduced injuries. In 1956 the average cost of repairs and preventive maintenance was $175 for the year (or only 68¢ a day) for each truck. Maintenance was performed by the local Lewis-Shepard representative.

Power costs for running the trucks have been decidedly cheap, according to company officials. Each truck uses only about 60¢ in electricity during an 8-hr shift. On a two-shift basis, the company estimates that it costs a maximum of $1.88 per day to own, operate, and maintain each truck in its fleet.

Tool expediting simplified

GORDON W RICHARDS,
tool planner,
Housewares & Radio
receiver div,
portable appliance dept,
GENERAL ELECTRIC CO,
ALLENTOWN, PENNA



Time lost by improper scheduling of tooling is money thrown needlessly away. A simple card system at the G-E Housewares Div expedites the various tooling phases between design of a new part and its actual production

There is probably nothing so devastating to a production line today as not having a special tool needed for a job. The machine may be ready and the worker waiting, but without a die or special fixture an assembly line can be shut down, workers sent home, and a whole plant idled, just as if fire or flood had crippled the plant.

Tool scheduling and expediting is an increasingly vital task today. A new product or a new model is the responsibility of a corps of men charged with acquiring carloads of the most complicated, precise equipment in a "lead time" that traditionally seems to be shortening. The trend today is to look to outside sources for such tooling, especially in peak production periods. In large programs it is not unusual to utilize a score of tool jobbing shops to meet a deadline.

While in-plant tool work can be watched and guided closely, tooling that is farmed out may call for real vigilance. The ideal situation would be to assign one man to each job; however, this is seldom practical, for the talent required to do an effective job is spread pretty thin. Evaluation of a job on the floor calls for a person well versed in tool design and toolmaking. He may also need to be a super-salesman to inject enthusiasm into a lagging project.

It is probable that top tooling personnel will concentrate on the really "hot" items. Certain portions of the program will not need prodding; on those that do need attention, personal visits and reports are necessary, with all vital information fed back to a central point where it can be evaluated.

Here is a simple system for pointing up these "lagging" phases. Needless to say, its success depends wholly on the accuracy of the information fed to it. Once set up, it can be maintained by non-specialized clerical help, if need be.

A chart lists the steps through which a part will progress during the tooling period. (In a small organization some steps may not be as much a part of the formal routine as in a larger company, but they are there nevertheless.) While this chart shows the progression of a new part through design engineering, the same procedure usually applies to those parts that are removed from current production for revision or modification; even major repairs or replacements follow almost the same sequence. These similarities allow all tooling projects to be maintained in one master file.

We now number the steps, as shown at the right of the chart. These numbers serve as code numbers on our master file cards, where they appear on a horizontal line marked "Steps Code" (see illustration).

To start a card we first fill in the schedule date for each step of the job. In some instances this will be a promise date from the vendor. More likely it will be a "best-estimate" date based upon final delivery promised. As the job progresses, performance dates are logged in spaces directly over their

Discrepancy	0	0	4	3	5		4	3	0	2	3	14													
Performance Date	JAN 4	JAN 8	JAN 21	JAN 21	FEB 6	–	FEB 8	FEB 8	FEB 11	FEB 25	MAR 8	MAR 30													
Schedule Date	JAN 4	JAN 8	JAN 17	JAN 18	FEB 1	FEB 4	FEB 4	FEB 5	FEB 11	FEB 23	MAR 5	MAR 16	MAR 22	MAR 27	APR 8	APR 10	APR 11	APR 15	APR 16	APR 18	APR 22	APR 25	APR 25	MAY 1	MAY 10
Steps Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Part Name _____ Part No. _____ Product _____

Type of Tool _____ Quotes _____ Source _____

P. O. No. _____

Date of Issue _____ Delivery (120) Days _____

Caution Yellow 5% Trouble Red 10%

scheduled date. The difference in scheduled and performance dates, in days, is then recorded on the top or "Discrepancy" line.

If a job in any phase falls behind so that the loss in days is equal to 5% of the total the job allows (120 days in the sample), this should be a caution signal. When this occurs, a yellow flag is affixed to the top edge of the card at that point, and expeditors are guided by this warning sign accordingly.

If the situation worsens and the loss in days rises to 10%, a red flag is attached to the card, signifying that the job is to be handled on a "crash" basis.

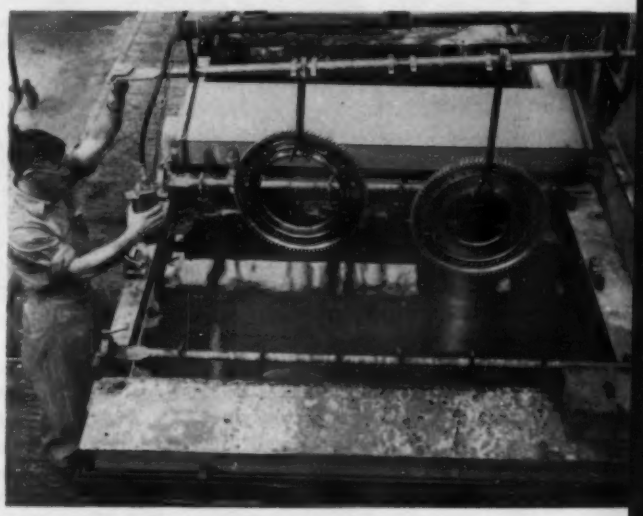
A file kept in such a fashion is very compact. It reveals visually, in an instant, the general tooling status, the number of jobs in danger, and further gives specific direction to corrective endeavors.

Sprayed tanks improve plating flexibility

Pratt & Whitney, East Hartford, Conn, has greatly increased the flexibility of its plating operations by spraying and baking an "all purpose" plastisol tank coating on 25% of its 2000 tanks—enough to provide adequate leeway in changing tanks from one use to another, a frequently necessity in aircraft plants where plating methods change with design changes.

The tanks have been sprayed with several coats of Unichrome 5300, a product of Metal & Thermit Corp, and then oven-cured at 160° F. Tanks treated in this manner are currently being employed for cadmium plating, copper plating, and lead-tin-antimony plating, for nitric and hydrofluoric acid solutions at room temperature, for hard anodizing at 45° F, and for cold-water tanks.

In addition to versatile resistance to solutions, the plastisol coating provides greater freedom in tank design. Dams can be installed close together, because little space is needed for the spraying operation. Furthermore, spraying of tanks after they have been put together is considerably less expensive than lining the components before assembly and patching seams afterward.



Tank coating resists corrosion . . .
from a variety of solutions; is sprayed and baked on inside and out; can be applied in light colors to improve appearance and encourage neatness

Wire-assembly conveyor belt starts in foreground (moving away from camera). Color-coded tags attached to wire indicate which operators work various wires in process. Each of the benches along each side of belt is tooled for a specific phase of assembly. Plug assembly is done on a specific line

When wiring rides the belt...

costs fall off 66%

Wiring assemblies are vital to all forms of modern aircraft manufacturing—whether manned aircraft or missiles. By engineering the assembly operation, Martin now produces a 3.4-min wire—with facilities for 1250 wires per hour

G L SMITH, supervisor, industrial engineering Standards and Methods Department THE MARTIN COMPANY, BALTIMORE 3

A conveyor-belt system developed by Martin's team of factory supervision and industrial engineers has enormously reduced materials handling, as well as cost, in producing wire-harness assemblies. Prior to installing this conveyor-belt system, operations such as cutting, numbering, stripping, dip-soldering, and plug attachment were performed at the same table. Instead of confusion, uneven flow of materials, heavy baskets of wires being carried, and low production rates, the new assembly line has smoothed material flow and stepped up production.

The assembly line consists, essentially, of two conveyor belts which move wires and other materials from one station to the next. Each operation on the wire is performed at a designated station, after which the wire is moved on the belt to the next station. Each operator's "pick up" is from the conveyor belt, and each increment of work is prominently color-coded for easy recognition. After the operation is performed and stamped "complete" by the operator, the work increment is returned to the conveyor and moved to the next station.

The new assembly line produces 3.4-minute wire, whereas a 9-to-10-minute wire was standard before. Wire of all types to 26 gage, including coaxial and shielded, is considered in this average. Labor cost has been reduced from approximately 29 cents per wire to 10 cents and 42 operators are doing the work previously done by 90. Production is running at 3,000 wires per 8-hr day, although the assembly line is equipped with stations to produce 10,000 wires when needed. Wire which formerly moved 4200 feet now moves only 425 feet from start to completion. Operators no longer carry large baskets of wire from one station to another, hence physical work has been lightened—a valuable morale factor.

The assembly line begins at a table at the head of the conveyor belt. Here the process sheets and wire cards are received and sorted by gage. The wire cards contain only the information needed on the assembly line for each type of wire.

Plug-assembly line, seen from one side, shows modular layout of stations. Each station is equipped with overhead lighting. "Combing" position, in foreground, provides long, clear area for sorting, straightening, and identifying assembled wires

Assembly fixture at one of several plugging positions in the line holds one lot of 10 plugs to which wires are attached. Wires to be used are supplied from racks positioned in front of and above operator

A bin number is assigned to each process sheet and to a "traveler" or wire tag which is attached to a plastic bag containing the wire card. The traveler contains coded information and space for each operator to initial after his operation is complete.

Next, wire cards go to a linotype operator who casts type for stamping tags, bundles, wires, and identification bands. After typesetting, an operator machine-stamps the vartex tags, bundle markers, and identification bands, and places them in the plastic bags. Moving from this step, four stations along the conveyor belt have electronic equipment which measures and cuts wire to a pre-determined length, counts the number of pieces, rolls each length, and stops after a pre-determined number of wires has been reached. This machine will handle from 12- to 22-gage wire. Wires heavier than 12 gage are routed to a special assembly line which contains machines designed for the heavier wire.

The tagging operator cuts vartex to length, slides it on the wire, and adds masking tape to hold it. On point-to-point wiring for chassis assembly, tagging formerly was done by stretching masking tape on the work table, stamping the proper number on the tape at one-inch intervals, and cutting the tape into inch lengths. Then each length was hand-wrapped around the wire. Now a simple machine feeds tape from a roll and a stamping mechanism adds the point-to-point number as the tape is applied to the wire, all in only a few seconds.

At a further position, nylon covering is removed from shielded wire by burning, then a pigtailing operation creates a shielded-wire ground. Skinning operations and dip-soldering occupy the next

station, followed by taper pin and lug assembly.

All wire assemblies flow into a Quality Control station where a complete inspection is made. Any flaw or missed operation is noted and the assembly returned to the specific operator responsible for rework or correction. The detail breakdown of each work station with its attendant specialization has minimized rejection and rework.

ACCUMULATION AREA

As each wire group flows along the conveyor line it carries the bin number which was applied at the start of the line. Each wire, therefore, has a definite destination to which it flows after inspection and acceptance.

The production control group moves the necessary hardware to complete an assembly into the proper bin, while the wires are moving along the conveyor. As the single wires are received into the bin they are checked off. When all of the hardware and wires have arrived at the accumulation bin, this material is moved to the head of the plug-assembly line.

PLUG ASSEMBLY

Arrival of the material for plug assembly initiates the flow through the assembly procedure. The first position is one of "make ready." Plugs are disassembled as necessary, manila identification tags are prepared for each assembly, potting molds are provided, and all parts are checked to prevent loss of operator time.

Wire ends are identified as "A" and "B". First operations are performed on the "A" end. The "B" end is the opposite end. There are several positions for A-end assembly, each equipped with special tooling to simplify manufacturing. At the first position after "make ready," a special fixture holds all the plugs in the lot (lots are in multiples of ten). This fixture is in the form of an arc and rests on the work table. Above it, in front of the operator, is a positioning rack containing wires to be attached to the plugs with solder or taper pins. In the assembly of wires to a plug, the lower left-hand pin is designated as No. 1, and wires are installed in rows from this point, left to right, and from bottom to top of plug. All No. 1 pins are wired, then all No. 2 pins, and so on. Some plugs carry as many as 50 wires. Bundle markers and sleeves are installed at this point by threading wire through them, using special tools.

When all of the wires are installed, a final A-end tie is made and identification tags are attached to each assembly. This assembly is removed from the fixture and placed in a tote pan which travels to the ground-ring position. A "comb out" position is off the line but adjacent to the ground-ring position, and operations are as the name signifies. If the plug assembly is to receive a B-end plug, the wires are cut to length and the individual ends are prepared. After combing out, temporary ties are made on those assemblies which go directly into potting or into the harness-board assembly.

When the combed-out assembly returns to the line, it flows from station to station as sequential functions are performed. Every assembly flows into an inspection station and is completely checked for continuity and parts placement. After acceptance, the material flows into the adjacent lines for harness assembly or potting.

Potting operations are performed on a roller conveyor which allows potting fixtures to flow, with a minimum of handling, through the curing ovens into a close-up operation and then to final inspection and acceptance.

HARNESS ASSEMBLY

Plug assemblies which are incorporated in the harness flow directly to the harness-board-assembly line and are integrated into a complete assembly. All harnesses are rung out for continuity after assembly, then they go through the potting procedure, including the final test procedure.

No wire or plug assembly goes through every process described. The operator at the first table determines which operations are to be made and indicates these on the traveler card. Color codes are also entered on this card to show operators those wires on which they will work as the wires pass by on the conveyor.

This assembly line has brought order and reduced material handling; it has eased the material flow. Each operator soon learns all operations and can be shifted to any station as required. This versatility not only keeps the materials moving but also gives operators a greater feeling of importance in the over-all job.

Recording Adherometer Evaluates Coatings on Metal

To check adhesive properties of coatings applied to metals that must stand high temperatures, such as ceramic coatings on aircraft materials, tests have been made in the past with an Adherometer. The main difficulty has been in getting accurate readings from the attached gages, which indicate the stripping force as a weighted knife cuts the coating away from a power-driven sample plate.

A new development, announced by the National Bureau of Standards, provides permanent records of the test by electronically averaging electrical impulses produced by the adherometer. The unit, called an integrometer, requires a simplified adherometer, which does not operate with the usual pendulum. Eleven materials were tested with the integrometer, with results indicating more accurate analysis of adhesive qualities. The integrometer should provide more accurate interpretation of adherometer data.

How to figure speed for LOWEST-COST MACHINING

By practical use of the minimum-cost chart, the authors have devised an approximate, or simple, method and also an exact method based on the Carboloy computer, to ascertain the cutting speed that gives the lowest cost for a given set of conditions

RICHARD J HERMAN, physicist and mathematician,

and LAMONT M LaROBARDIER, visiting lecturer, Stevens Institute of Technology; consultant in industrial management

Costwise optimization is a scientific method of determining optimum operating conditions by *minimizing* total cost through the use of mathematical models.

The examples given show the technique applied to a turning operation, in order to find optimum cutting speed for the largest feed that produces acceptable finish. The same model can be applied to drilling, milling and shaping by using appropriate parameters.

OPTIMIZATION FACTOR

The technique of costwise optimization can be applied in simplified form, as shown in the sample application, by a solution based on initial operating results and adjustments by use of the optimization factor. The technique is equally well suited for the predetermination of optimum operating conditions for use in standardization and control.

Costwise optimization constitutes an advance over present methods because: (1) it is a scientific method, (2) *all* costs are considered in the form of a mathematical model, and (3) optimum operating conditions are derived mathematically.

Present methods of determining operating conditions are based on *experience alone*—either directly by operator judgment, or indirectly through time studies or standards, or through specialized computers, such as General Electric's Carboloy Machinability Computer,* which have the parameter relationships built in. These methods predetermine possible *satisfactory* operating conditions from the standpoint of quality alone, but in no way *optimize in terms of total cost.* Cost is usually considered intuitively only, taking into account neither the actual values nor the characteristics of all the cost factors. In the few instances where cost characteristics have been given consideration, there has been no direct correlation between cost and the physical characteristics of the operation.**

Indicating the cost characteristics is an important step in the proper consideration of cost, but it is only when these relationships are correlated with the physical operating characteristcs from experience, in a mathematical model, that we can provide management with a *ready* tool for reducing costs. Costwise optimization provides this ready tool.

ECONOMICAL SPEED LOCATED

As an illustration, with the knowledge that tool costs per piece increase as cutting speed is increased, and that labor-overhead costs per piece decrease as cutting speed is increased, we can conclude only that the most economical operating speed is somewhere between the minimum and maximum speeds available. When these relationships are expressed in precise terms in the mathematical model, the most economical speed within the range available can be determined specifically.

By costwise optimization, management will know with certainty that they have *reduced their cost to its absolute minimum* with existing equipment and procedures. Operating standards can be set up on a rational cost basis rather than on the basis of past experience, or operator judgment. With this ability to predetermine operating conditions without dependence on operator judgment, another major step toward automating machine operations has been achieved from costwise optimization.

SIMPLE CALCULATIONS

The technique itself is comparatively simple. Once set up for a particular type of operation, general office personnel can apply the technique directly from the formulations below or by the use of tables, slide calculating devices, or analog computers. Because of its simplicity, the procedure is more likely to gain acceptance from the standpoint of human relations.

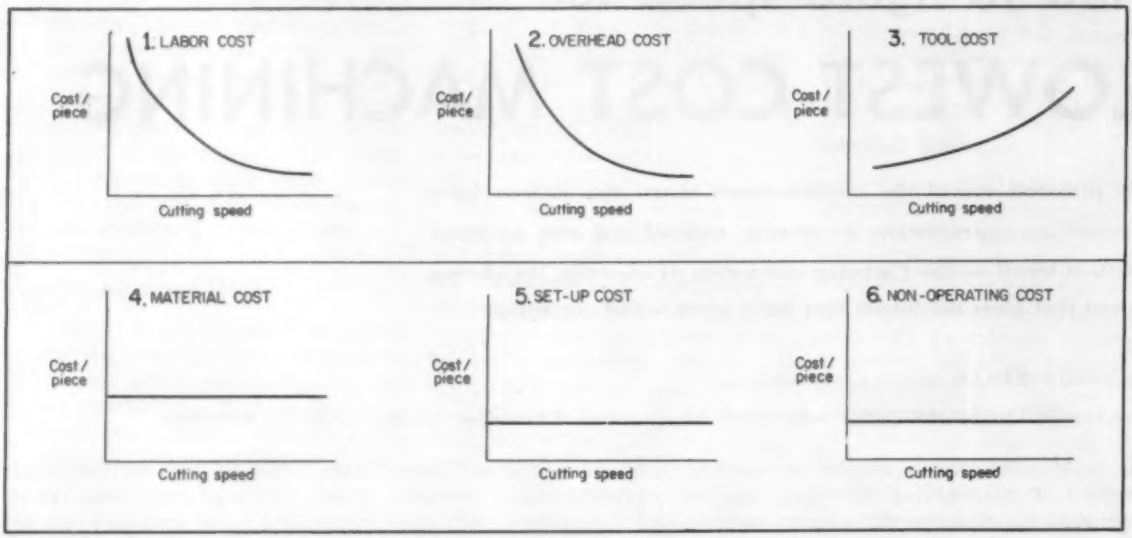
Historical data no longer affords management the necessary information for modern competitive operation. Modern management must have tools by which it can determine not only what will happen if the past is repeated, but more important, what will happen under revised or improved operating conditions. Costwise optimization enables management to determine:

* Developed under the direction of Dr W W Gilbert, Mfg Services Div, General Electric Co, Schenectady, N Y.

** See for instance, *"How to Cut Costs with Carbides by "Hi-E" Machining,"* by T E Hayes, (AM—Dec 19 '55, p 121)

LOWEST-COST MACHINING . . .

Curves for Unit Costs Are Combined to Produce



Three of the unit costs vary with cutting speed; three others are constant

1. The best or most economical operating conditions
2. The cost at the most economical operating conditions
3. The cost at present or any other operating conditions
4. A true comparative analysis
5. Maximum cost reduction

The application of costwise optimization below was developed by the authors since May 1956 at the Columbia Institute for Research in the Management of Industrial Production. The work was conducted as part of an automation research contract for the Office of Ordnance Research, Department of the Army, with advice from Ordnance Weapons Command.

Experimental test data was obtained under actual production conditions at the Watertown Arsenal. Technical and physical relationships are based on the experimental data amassed by Dr. W W Gilbert, of the Manufacturing Services Division, General Electric Co, Schenectady, N Y, during 20 yr of metal-cutting research at the University of Michigan.

By analyzing each of the unit costs, we see that:

1. Labor cost per piece will decrease as cutting speed is increased and more pieces per hour are produced.

2. Overhead cost per piece will decrease as cutting speed is increased and more pieces per hour are produced.

3. Tool cost per piece including replacement time, grinding and original investment will increase as cutting speed is increased.

4. Material cost will remain constant as cutting speed is varied.

5. For any particular lot size, set-up cost per piece will remain constant as cutting speed is varied.

6. Non-operating cost per piece, excluding time for tool replacement, will remain constant as cutting speed is varied.

If we take the total of the above costs, we will find that a plot of the total cost per piece will follow the shape of the minimum-cost chart. Cutting speed "x" results in minimum total cost.

The exact determination of optimum point "x" involves lengthy mathematical calculations. We shall present the results here and refer the reader interested in the mathematical details to "Proposed Procedure for Experiments on Machine Tool Operation at Watertown Arsenal," by Merrill M Flood, Richard J Herman and Lamont M LaRobardier, and "Final Report - Automation Research Project," by Richard J Herman and Lamont M LaRobardier, both published by the Columbia Institute mentioned.

There are two methods of determining the optimal operating conditions. One requires a preliminary experiment. The other permits a predetermination of the optimal point. The experimental method, while it has the disadvantage of requiring an initial test, is more reliable than the theoretical one and involves simpler calculations. We shall give it first:

METHOD A (SIMPLIFIED)

1. Choose any feed and speed at which the operation meets the finish requirements. Example: the feed and speed at which the operation is now running.

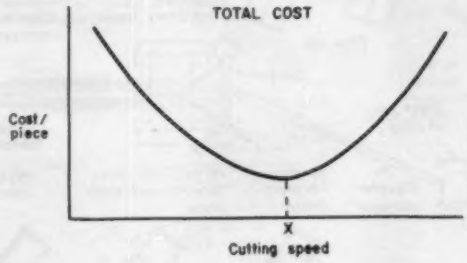
2. Keeping the speed the same, increase the feed to the maximum value for which the finish is acceptable. This is the optimal value for the feed. This step is unnecessary if the optimal feed is chosen

DERIVATION

The total cost per unit of production may be expressed as:

Total		Labor		Overhead		Tool		Material		Set-up		Non-operating
cost/pc	=	cost/pc	+	cost/pc	+	cost/pc	+	cost/pc	+	cost/pc	+	cost/pc

Minimum-Cost Chart



Least cost x is what you solve for with either the simplified or exact formulas

in Step 1.*

3. Measure the number of pieces produced under these conditions before a tool change is necessary.

4. The optimal speed is then calculated from the formula:

$$\text{Optimal speed} = \text{Experimental speed} \times \text{Optimization factor}$$

where:

$$\text{Optimization Factor} = \sqrt[4]{\frac{(\text{Cost/min. of labor \& overhead}) \times (\text{no. pieces/tool change}) \times (\text{length of cut})}{3 \times (\text{cost per tool change}) \times (\text{experimental speed in rpm}) \times (\text{optimal feed})}}$$

This formula is valid for carbide tools. It can be modified to fit high speed tools merely by changing the fourth root to an eighth root and changing the 3 in the denominator to a 7.

EXAMPLE A:

Cost/min. of labor and overhead	\$0.24/min.
Pieces produced/tool change	15
Length of cut	8 in.
Cost per tool change	\$0.62
Experimental speed	169 rpm
Optimal feed	0.011 ipr

For this data, our formula gives

$$\text{Optimization factor} = \sqrt[4]{\frac{0.24 \times 15 \times 8}{3 \times 0.62 \times 169 \times 0.011}} = 1.7$$

Thus, the speed should be increased by a factor of 1.7 to optimize.

$$\text{Optimal speed} = 169 \times 1.7 = 287 \text{ rpm}$$

* Tables can be drawn up showing optimum or maximum feeds for various finishes and machinability ratings.

METHOD B—PREDETERMINATION OF OPTIMAL SPEED

We use the maximum value of the feed* that meets the finish requirements, just as before, but in this method no experiments are necessary to find the optimal speed. It can be predetermined from the following formula:

$$\text{Optimal Speed} = \frac{K \times MCF \times MF \times SCF \times TTF \times WL^2 \times TPF \times TMF \times CFF \times LOC^{0.25}}{f^{0.58} \times d^{0.2} \times BHN^{1.72} \times \text{No. teeth}^{0.16} \times TCC^{0.25}}$$

* From Tables

K	=	1.09×10^8
MCF	=	Material Cut Factor
MF	=	Microstructure Factor
SCF	=	Surface Condition Factor
TTF	=	Type of Tool Factor
WL	=	Wear Land, in.
TPF	=	Tool Profile Factor
TMF	=	Tool Material Factor
CFF	=	Cutting Fluid Factor
LOC	=	Labor and Overhead Cost, \$/min.
f	=	feed, ipt
d	=	depth of cut, in.
BHN	=	Brinell Hardness No.
TCC	=	Tool Change Cost, \$

EXAMPLE B:

To illustrate the use of this formula, we solve the sample problem stated in the Carboloy Machinability Computer Manual:

"Determine the optimal speed to make a ⅛ in. cut in a hot-rolled 1020 steel bar, using a grade 350 Carboloy cemented carbide tool."

For the type of work material and tool specified, the tables in the Manual give the following values of the tool and material factors:

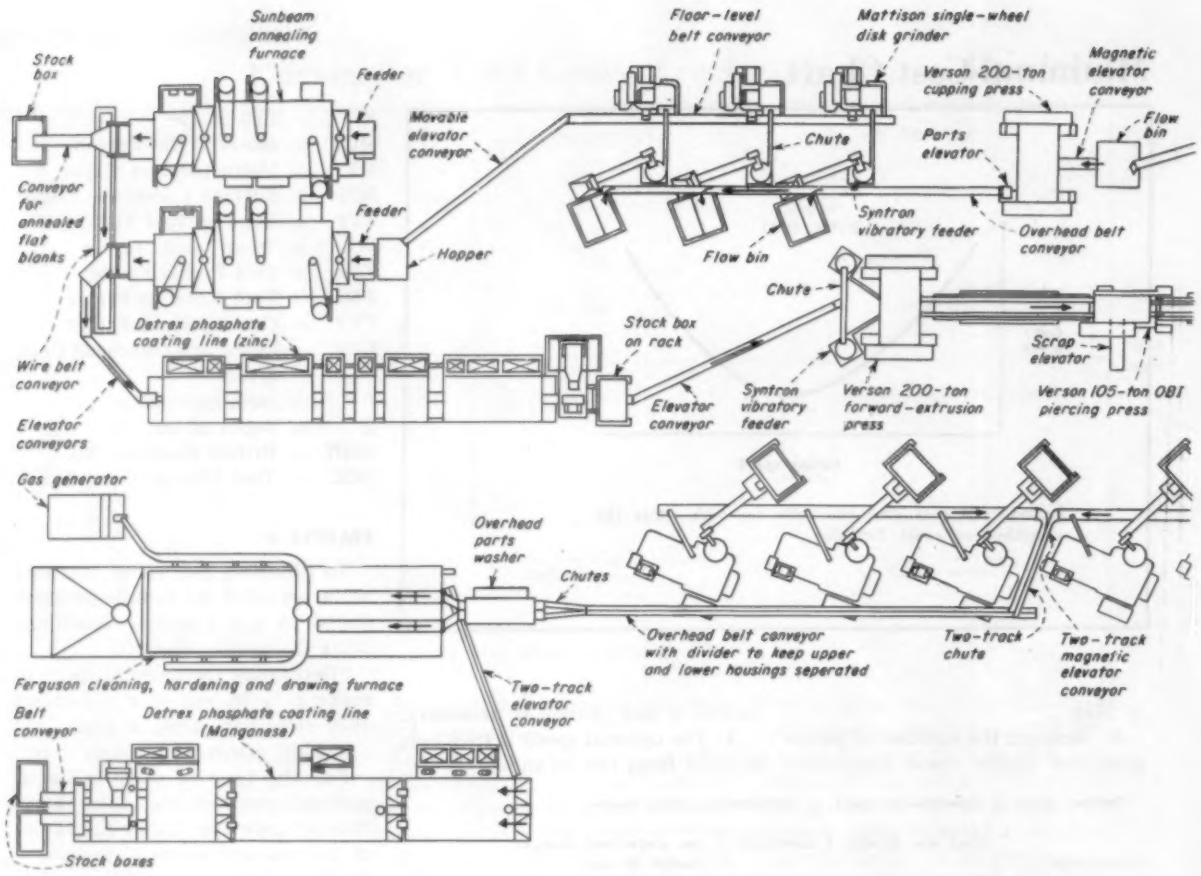
MCF	= 1.0	TPF	= 1.0
MF	= 1.0	TMF	= 5.5
SCF	= 0.8	CFF	= 1.0
TTF	= 1.0	BHN	= 150
WL	= 0.03		

Suppose that we have found the maximum feed that meets the finish requirement to be 0.015 ipt and the cost factors to be those given in the previous example: LOC = \$0.24 per min. TCC = \$0.62 Then the formula gives:

$$\text{Optimal Speed} = \frac{1.09 \times 10^8 \times 5.5 \times (2.4)^{0.25}}{(0.015)^{0.25} \times (0.125)^{0.2} \times (150)^{1.72} \times (0.62)^{0.25}} = 1000 \text{ fpm or } 570 \text{ rpm}$$

Method A is particularly useful for the shop that does not predetermine speeds and feeds, and can be applied at the machine by use of a simple slide calculator or table by non-technical personnel.

Method B, on the other hand, is suitable to those companies that predetermine speeds and feeds in standards or methods departments by engineering and technical personnel.



Fork trucks and conveyors combine in . . .

Chrysler's Double-Duty Extrusion Line

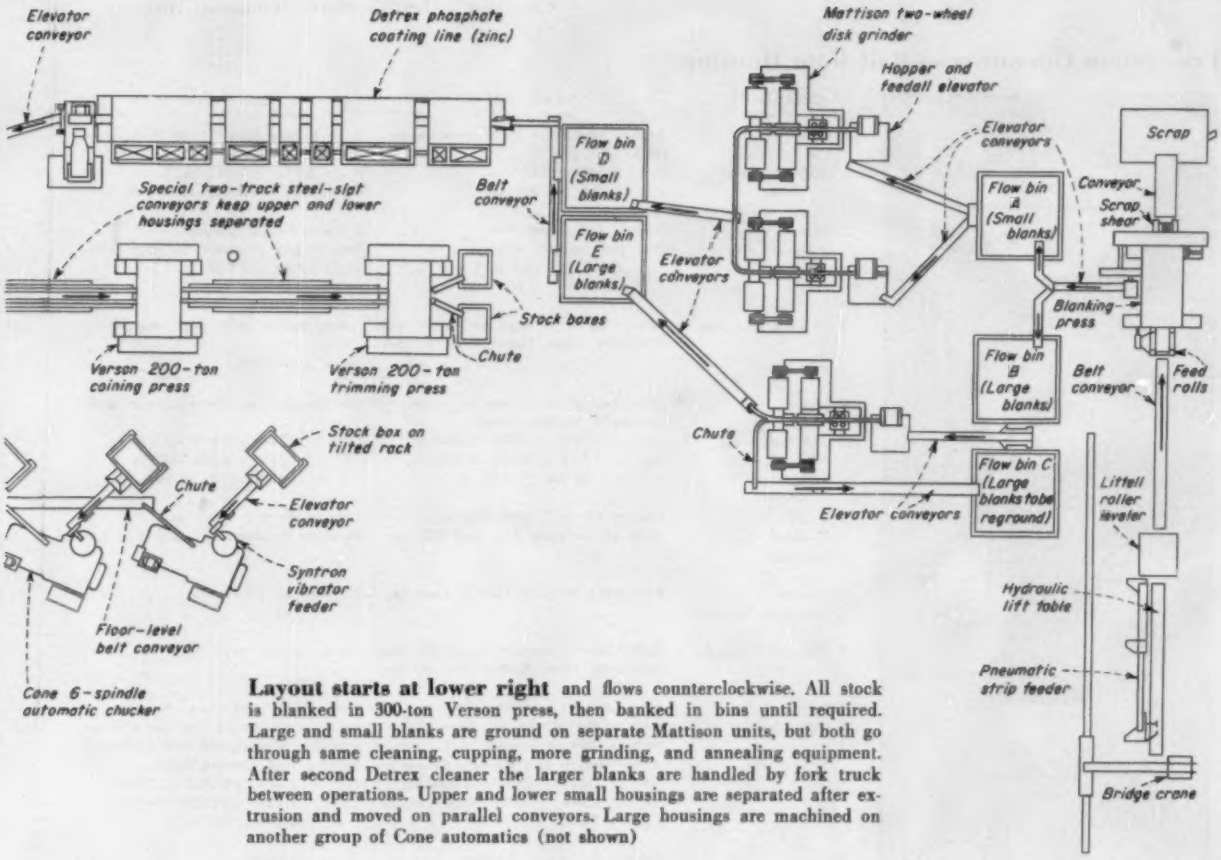
It produces upper and lower housings for ball-joint suspensions in two sizes, the smaller for Plymouths and Dodges, the larger for DeSotos, Chryslers, and Imperials. The line dovetails automatic and fork-truck materials handling that neatly balances high production on the smaller housings and lower production on the larger. Most important single operation is forward-extruding, which cold-forms the cup-like housings from inexpensive steel to make a stronger product than formerly possible

R H DUNGAN, manager, New Castle Machine Plant, CHRYSLER CORP, NEW CASTLE, IND
as told to BEN C BROSHEER associate editor

Materials handling on this press line is a canny combination of automatic conveyors and fork-truck tote boxes, all aimed at one point—lowest operating and investment costs.

Stock is C-1011 hot-rolled steel, sheared into strips and fed to the blanking press where three pieces are cut out per stroke. One size of blanks is built up in its storage bin while the other size is fed through the press line, so production is on a shuttle basis. Because of larger quantities, the smaller size takes up more production time.

Extra storage is provided after the double face-grinding operation because some larger blanks require double grinding. Oversize blanks are stored until a reasonable lot



Layout starts at lower right and flows counterclockwise. All stock is blanked in 300-ton Verson press, then banked in bins until required. Large and small blanks are ground on separate Mattison units, but both go through same cleaning, cupping, more grinding, and annealing equipment. After second Detrex cleaner the larger blanks are handled by fork truck between operations. Upper and lower small housings are separated after extrusion and moved on parallel conveyors. Large housings are machined on another group of Cone automatics (not shown)

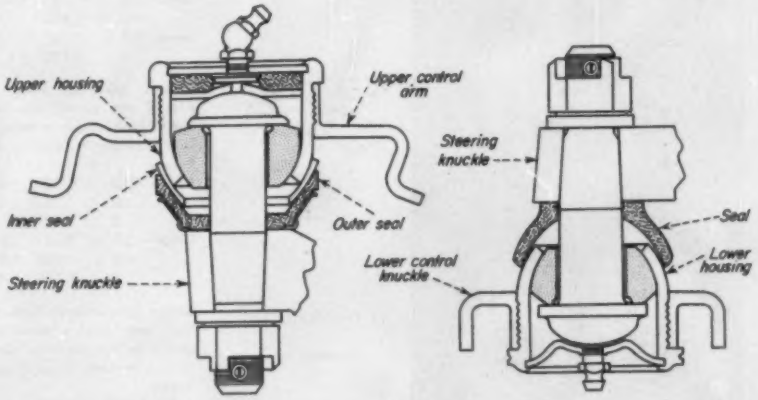
accumulates, then the lot is reground and sent on into production.

Press speeds are all the same, except for blanking, to simplify mechanized parts handling between presses. Die design, ram speeds, pressures, and lubricating techniques were all worked out by Verson Allsteel Press Co engineers; production schedules and materials-handling techniques were developed by Chrysler engineers to fit the special problems involved in balljoint production.

MACHINING

After the press operations, housings are machined in Cone chuckers tooled individually for each size and shape of workpiece—large, small, upper, or lower. Although there is a break in the continuous flow line before machining, the smaller housings are handled within the machining line by chutes and conveyors.

Among additional operations not pictured is shaving wrench flats on the housing OD's, done in a trimming press fitted with interchangeable die inserts. Negative-rake lands are ground along cutting edges to use "pressure-cutting" principle developed by Verson to reduce tearing of the shaved surfaces.

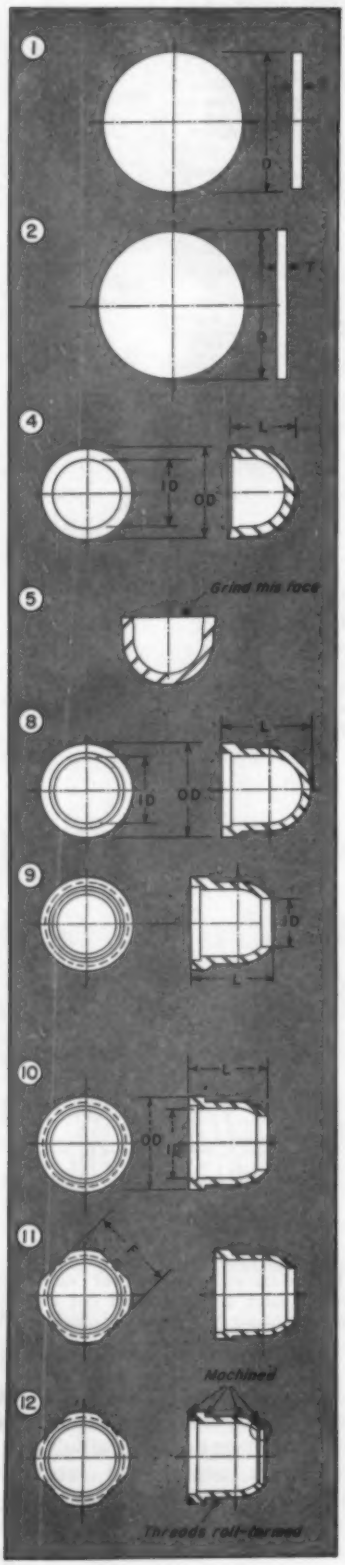


Housings are assembled into complete ball joints at 12-ton Denison Multipress with indexing table and tooling that brings in all parts. Lip at flanged end of each housing is crimped over the cover plate after being softened by 100-kw induction heater next to assembly machine

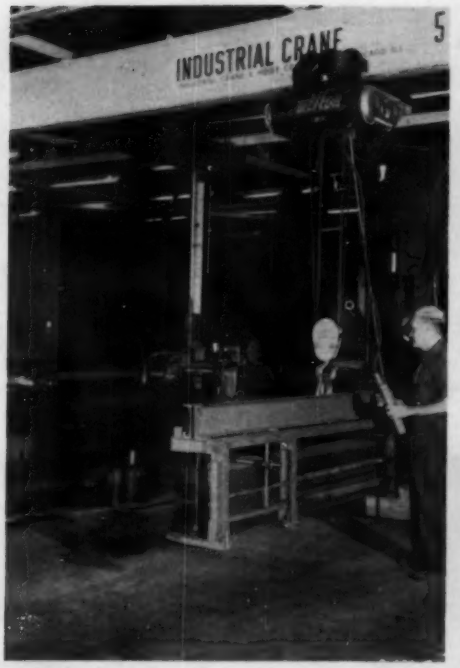
Final operation on balljoint assembly is addition of lubricant fittings and a measured amount of lubricant into each unit.

PLEASE TURN PAGE ▶

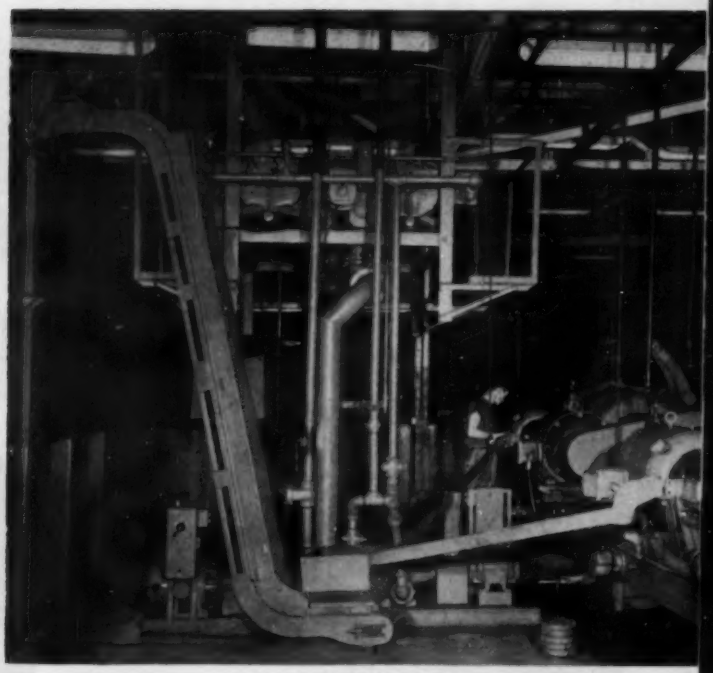
Production Operations—Ball-Joint Housings



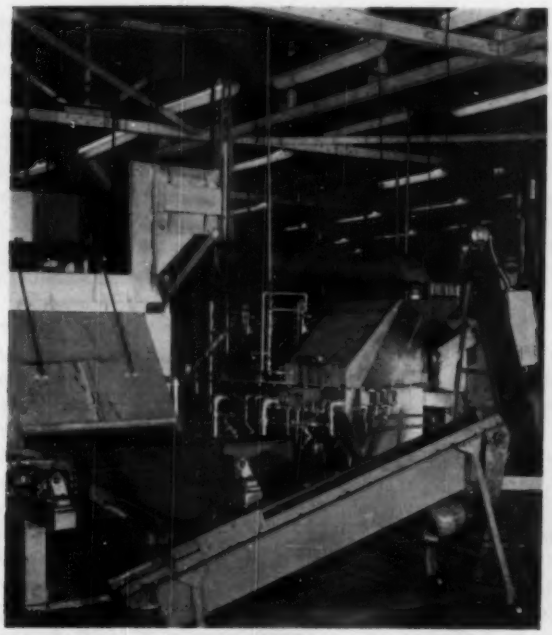
OPERATION	SMALL SIZE	LARGE SIZE
1 Blank (300-ton press)	3 at a time from 9 15/16-in.- wide stock D = 3.338 ±0.005 in. T = 0.226 ±0.006 in.	3 at a time from 11 1/16-in.-wide stock D = 3.712 ±0.005 in. T = 0.260 +0.015 –0.010 in.
2 Grind (2-wheel disk grinder)	2 faces flat & parallel One pass usually enough T = 0.218 ±0.002 in.	2 faces flat & paralel Two passes if stock on high side T = 0.250 ±0.002 in.
3 Clean & lubricate	Both sizes—nine-stage automatic wash, rinse, pickle, cold rinse, hot rinse, Bonderite, rinse, Bonderlube, air dry	
4 Cup (200-ton press)	Same operation— Draw two pc at a time in two-position carbide cupping die equipped with automatic loading fixture OD = 2.101 +0.008 –0.000 in. ID = 1.561 +0.000 –0.005 in. L = 1 45/64 ±1/32 in.	OD = 2.280 +0.005 –0.000 in. ID = 1.723 +0.000 –0.004 in. L = 2 1/32 ±1/32 in.
5 Grind (1-wheel disk grinder)	Flat at 90 ±1° with cup axis Hold wt between 226 and 230 gm	Flat at 90 ±1° with axis Hold wt between 324 and 328 gm
6 Anneal (conveyor furnace)	Both sizes—heat to 1320 F, hold for 6 hr, then air cool	
7 Clean & lubricate	Both sizes—nine-stage automatic wash, rinse, pickle, cold rinse, hot rinse, Bonderite, rinse, Bonderlube, air dry	
8 Extrude (200-ton press)	Form upper & lower housing at each press stroke in two-position carbide die equipped with automatic loading and ejecting fixture OD = 2.117 +0.005 –0.000 in. ID = 1.564 +0.005 –0.000 in. L = 1.940 ±1/32 in.	Form upper and lower housings at each press stroke in two-position carbide die equipped with automatic loading and ejecting fixture OD = 2.304 +0.005 –0.000 in. ID = 1.724 +0.005 –0.000 in. L = 2.280 ±0.032 in.
9 Pierce (105-ton press)	Upper & Lower housing bottoms pierced for stud-clearance hole in two-position die equipped with automatic loading and ejecting fixture Upper—ID = 1.313 ±0.005 in. L = 1.630 ±1/32 in. Lower—ID = 1.183 ±0.005 in L = 1.730 ±1/32 in.	Same operation— Upper—ID = 1.285 ±0.005 in. L = 2 1/16 ±1/32 in. Lower—ID = 1.223 ±0.005 in. L = 2 1/16 ±1/32 in.
10 Coin & size (400-ton press)	Process spherical bore and open end of one upper, one lower housing at each stroke in two-position die with automatic loading & ejecting fixture Upper—OD = 2.120 ±0.010 in. ID = 1.560 ±0.005 in. L = 1.750 ±0.020 in. Lower—OD = 2.120 ±0.010 in. ID = 1.560 ±0.005 in. L = 1.785 ±0.015 in.	Same operation— Upper—OD = 2.310 ±0.010 in. ID = 1.720 ±0.005 in. L = 2.120 ±0.030 in. Lower—OD = 2.310 ±0.010 in. ID = 1.720 ±0.005 in. L = 2.180 ±0.020 in.
11 Trim flats (200-ton press)	Shave four wrench flats on one upper, one lower housing at each stroke in two-position die equipped with automatic loading and ejecting fixture F = 1.900 ±0.005 in.	Same operation— F = 2.119 ±0.005 in.
12 Machine (6-spindle chuckers)	Turn OD and roll thread on separate machines tooled for upper and lower housings and equipped for automatic loading and unloading	Same operation—
13 Clean (caustic washer)	Both sizes—remove heavy-duty sulphurized cutting oil and other foreign matter	
14 Heat-treat (conveyor furnace)	Clean, Carbo-Nitride to harden, quench, wash in caustic, and draw in automatic cycle—separate conveyors for upper and lower housings	Same operation—
15 Finish	Both sizes—clean and coat in seven-stage automatic Parco-Lubrite process to apply hard, corrosion-resistant finish	



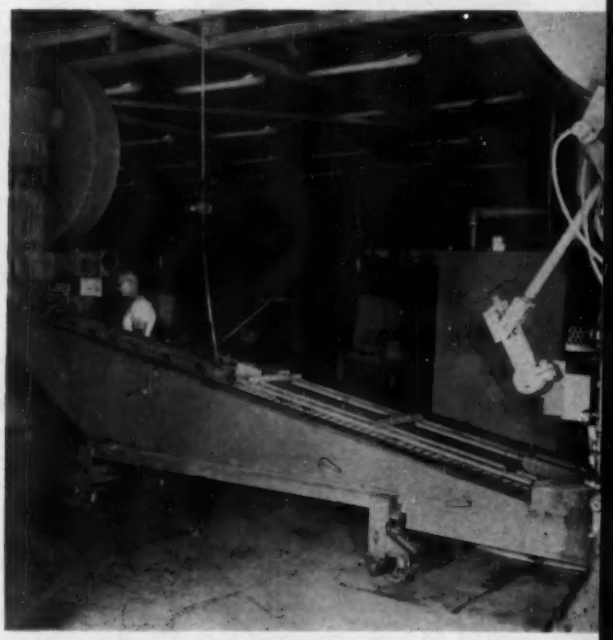
Stock 7½ to 10 ft long is fed by special table to straightening rolls in front of blanking press. Table has automatic hydraulic leveller that lines up top strip with straightener. Bridge crane carries fork attachment to load table



Elevator conveyor picks up double-ground blanks from chute and delivers them to storage bin, where they are banked after being blanked and sized. Pumps and piping overhead are for central cutting-fluid system for one group of grinders. Sludge is carted outside in wagons



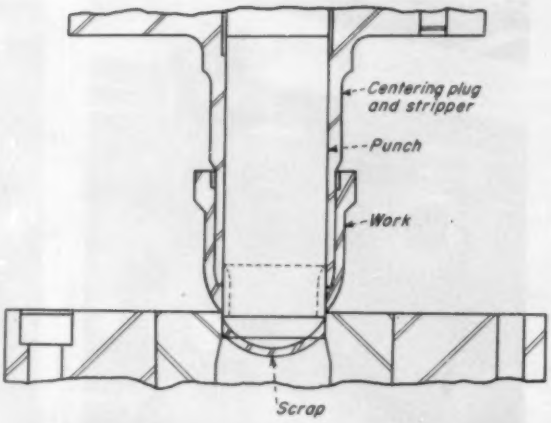
Movable elevating belt conveyors transfer cups from annealing furnace to cleaning unit (right). Annealing removes cold-worked stresses and conditions steel for plastic flow in extruding operation to follow

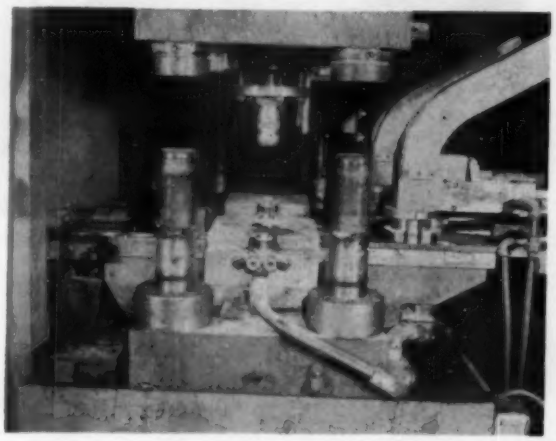


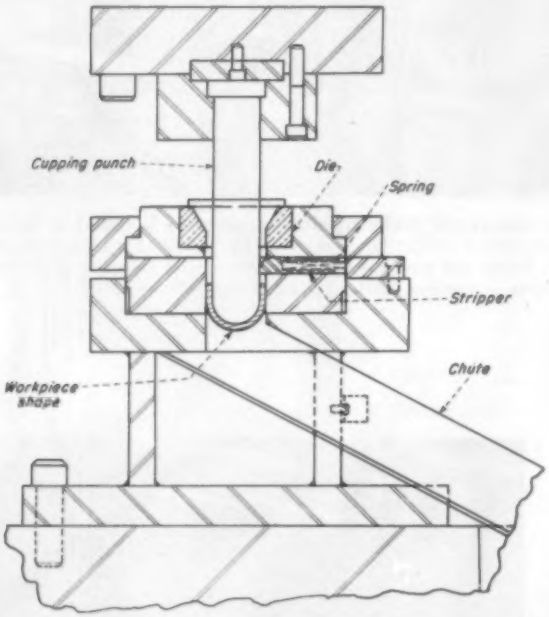
Transfer conveyor between extruding and piercing presses has two sets of slats that keep upper and lower housings apart. Dropoff chute halfway up the conveyor allows storing up workpieces if piercing press is stopped for some reason

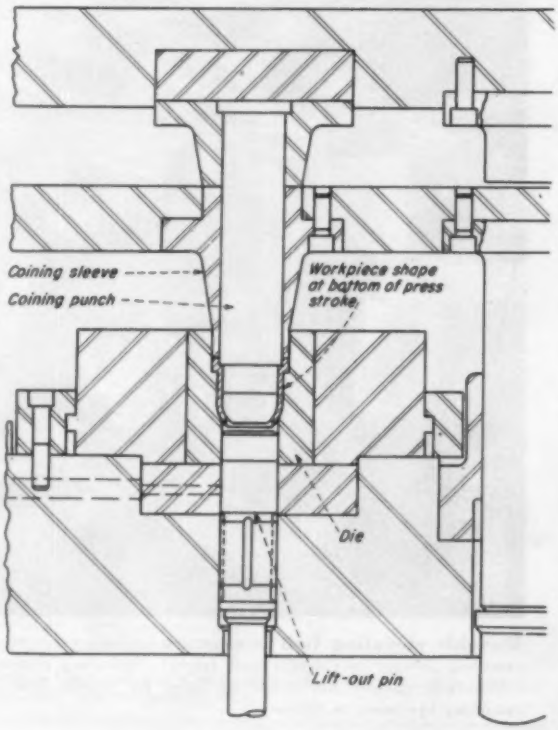
Chrysler's double-duty extrusion line . . .

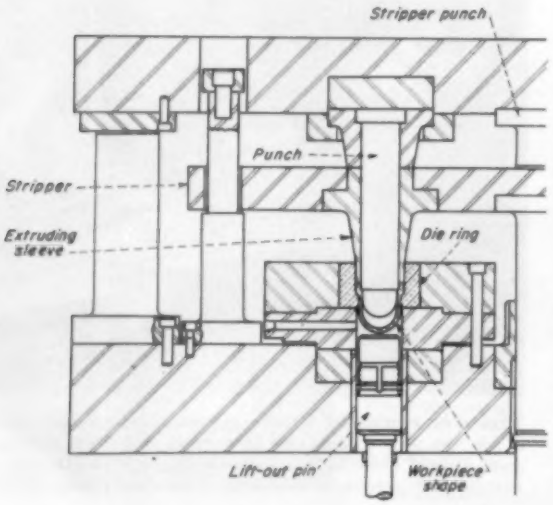
Press operations are carried out with replaceable die inserts that allow switching production from large to small housings, and vice versa. First set is for cupping (below) with carbide die, HSS punch. Second (bottom) is extrusion set; punch helps form orifice through which steel is forced by extruding sleeve. Photo and next sketch (top right) show piercing set, which is fed parts by load-and-eject fixture attached to die shoe. Note work-centering plug that aligns the housing. Last sketch shows coining set, which shapes flange end and inside curve on housings. Dies each do an upper and a lower housing at one stroke.











Bubbles, ripples, and cricket noises mean . . .

Ultrasonics clean really clean

A R McCLOSKEY, chief engineer, THE HEIM CO, FAIRFIELD, CONN

Here is an outstanding example of how a relatively simple change in one operation can have an important effect upon a whole production program. It took Heim engineers one minute—that's the length of the new cleaning cycle—to agree that ultrasonic cleaning beat older methods by far when applied to bearing balls.

The main problem previously was the lapping compound, which carried over into a grinding operation. The balls are drilled, heat-treated if they are SAE 52100 steel, not treated if they are sintered iron, then deburred, lapped, cleaned, tumbled, end ground, chamfered, honed, and finally inspected. Lapping compound left over inside the drilled holes interfered with fitting the balls onto grinding-fixture pins, where there was only 0.001 in. clearance. It also gradually wore down the pins.

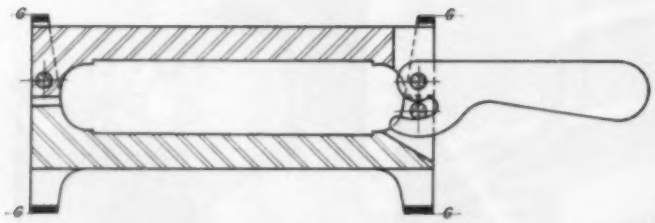
Ultrasonic cleaning, on the other hand, removes all compound from outside and inside the balls, allowing them to fit the fixture pins easily, and leaving them with a sparkling 5-mu-in. finish. Equipment for the job is a Sonogen APT-100-B generator driving eight transducers in the bottom of a special shop-built tank that holds two parts baskets and a thermometer. Frequency is 38,000 cps. The cleaning solution, Oakite 77, is held at 140 F and is drained once a week to carry off settled compound that would otherwise foul the transducers. Actually, so much compound is removed that a precleaning is necessary to remove the bulk of it; otherwise the tank would load up much faster.

Balls are loaded in the baskets to a 2-in. depth. Cleaning takes a minute, though the operator may not remove the work immediately because he may be busy with other tasks. Results are less production time, longer fixture wear, and better work quality.

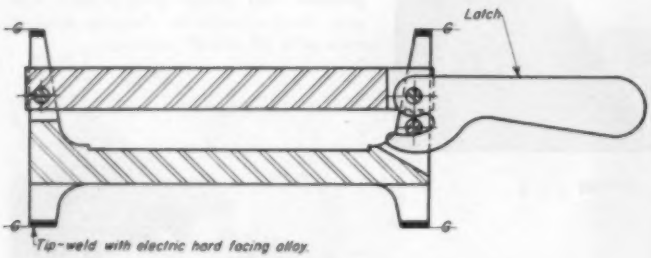
Heavy traces of lapping compound were always present after balls were hand-agitated in cleaning solution, even after 10 min of cleaning

Leftover compound wore down locating pins on grinding fixture where ball ends are flattened. Ultrasonic cleaning has eliminated excess wear and interference in slipping the balls into place

Ball bores are checked before assembly into rod end or bearing. Better cleaning has improved product with better accuracy and finer finish



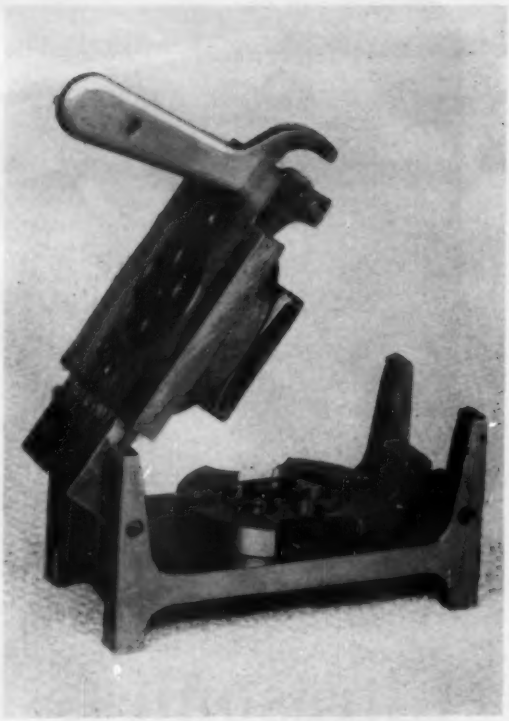
Optional construction using channel iron for leaf.



Tip-weld with electric hard facing alloy.

Optional construction using flat rolled plate for leaf.

Standard structural shapes become drill jigs . . . easily and simply. Only the surfaces marked need to be machined when a jig of this type is fabricated



Jigs can easily carry accessories . . . such as nesting plates, clamp pads, and other workpiece locators. Cam latches are of standard design and are interchangeable. This jig locates five 5/16-in. lightening holes in gear blanks

Jigs and fixtures made quickly from

An assortment of I-beams, Channels, and H-beams in your storeroom will give you a running start for making small locating and holding devices

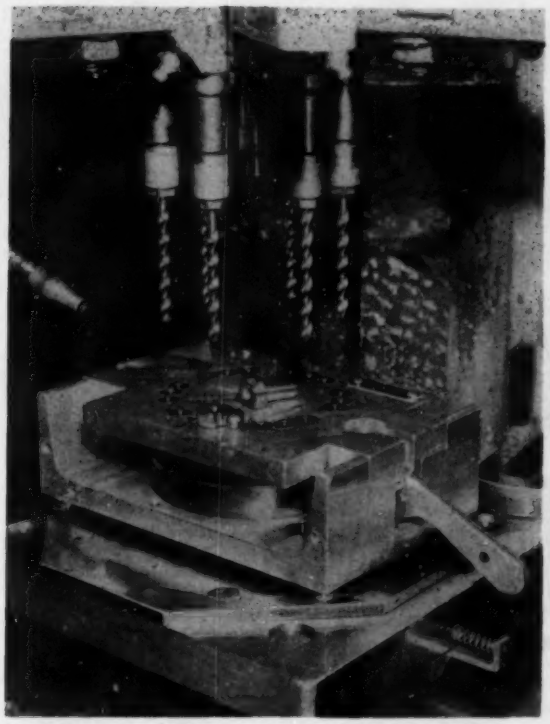
BEN C BROSHEER, associate editor

When you need a small jig or fixture in a hurry, you can make one easily and inexpensively from a piece of standard channel, H-beam, or I-beam. All you have to do is clean it up and square it up, and you have the base and sides of a box. And by keeping a supply of a dozen or so standard shapes and sizes in the toolroom, you have the "makings" of a large number of tools for small to medium-size parts.

The basic design for this type of tool, which is in constant use at the Aeronautical Div of Minneapolis-Honeywell Regulator Co, was developed by Arthur Stockwell, who is now supervisor of apprentice training at the company's main plant in Minneapolis.

Jigs and fixtures like these can be built from either rolled steel sections or extruded aluminum sections, but for use with small-diameter drills, reamers, and taps, aluminum is preferable. A lighter jig can be moved around more easily and centered more accurately under the cutting tool.

In either case, the heaviest available standard sections should be kept in stock, so the "legs" of the section will provide adequate support for hinges and



Drill jig made from 61S-T6 aluminum channel is mounted on indexing base for drilling 18 holes with 6 drills. The jig is approximately 6 in. square

structural sections

clamping pins when the boxes have been machined and assembled.

FABRICATION

Wear buttons can be bolted or welded on the bottoms of the structural shapes, or hard-faced tips can be applied (sketch). The hard facings or wear buttons are applied before any squaring cuts are taken.

Because steel shapes are hot rolled, little distortion occurs during or after machining and jig boring. Nevertheless, it is considered desirable to normalize a steel section before taking finishing cuts.

Hinged lids can be made from flat rolled plate, or when necessary, greater space can be provided within the jig box by inverting a channel section over an I-beam section and hinging them together.

The application of standard structural shapes to jig- and fixture-making results in greater freedom in design than formerly was possible with standard-stock jig boxes. All the advantages of reduced time and expense associated with stock jig boxes are realized, plus freedom from limitations on length.

Meter Checks Cleanliness

Surface condition of sheetmetal parts that are to be spot welded together is checked in a new instrument developed by Bernard Gross and John C Yager at Rohr Aircraft Corp.

The amount of current and the electrode pressure required for proper spot welding depends on the resistance of the metal to current flow. Because dirt, grease, or metal oxides on the surface cause the resistance to vary, the parts must be cleaned. The new instrument checks the cleanliness by measuring the resistance.

A pair of hollow electrodes is mounted opposite each other in positions to be pressed against opposite faces of the metal being tested. Each electrode has a small metal probe in the center surrounded by an insulating sleeve to prevent contact between probe and electrode.

Probes contact opposite faces of the metal when the electrodes are pressed against them and are connected to an ohmmeter to record the difference potential.

Because this difference is slight, an amplifying circuit is provided and the reading presented in microhms.

Pickling Hooks Are Fabricated from Monel

Major problem in designing hooks for handling 5000-lb coils of wire and rod through pickling process is resistance to corrosion while maintaining maximum efficiency. Experience with hooks made from Monel nickel-copper alloy indicated its choice for a new pickling line installed at the Donora plant of American Steel & Wire Div of U S Steel Corp.

Either casting or welding could be used in the construction of hooks of this capacity, but there are important differences in cost, size, and life capacity. Cast hooks would be more economical, initially, but would be more than twice the size and weight of fabricated ones. This was important because it would mean larger and more expensive cranes and other handling equipment.

Also, because the hooks are immersed in the pickling solution, tank size for the same payload would be increased.

Decision was therefore to employ fabricated construction, and the units were built by Youngstown Welding & Engineering Co. The hook proper is a reinforced Monel I-beam with a web ¾ in. thick and flange bars 1 x 4 in. Under 5000-lb load, the end of the hook deflects less than two in.

The round top bar carrying the hook is an 8-in. steel tube clad with ⅛-in. Monel sheet. The cladding is not so much for protection of the tube as to prevent rusty moisture from dripping on the coils. Such drip has, in the past, caused stains on the work and required reprocessing or, in extreme cases, resulted in scrap.

Round Table...

Down Time Makes Time?

"Don't get me wrong, Al; I'm happy to have five extra men, even if it's only temporary. I've got plenty of work they can do. But what in the world are they doing, taking five men away from your lathe section? Are we going to give up making our best products?"

"I'll admit it looks funny, Ed, but it evidently makes sense to Harrison, and he's the boss. He was telling me that this 'Linear Programming' idea is responsible for my losing five lathe hands. It seems we're too far ahead on some lathe work, and have to let the rest of the shop catch up."

"I don't know what 'linear programming' means, but I do know the company can't make money if five lathes are idle. That's a principle as old as the hills. If you've got production equipment, you have to keep it working."

"Well, in this case the engineering department worked it out in dollars and cents, and they decided it would cost us more to keep those lathes running than to leave them idle and use the men in your press department."

"I'm glad *somebody* decided it. I'd hate to think it was just an oversight. Now we can run into the red, and we'll know exactly who to blame."

"Look, Ed, here's how Harrison explained it to me: It seems that if we keep on turning out parts on those turret lathes the company will have to store them until all the other parts of the assemblies are made; then they can put them together and ship out the mechanisms. But it will cost more to store the parts than it actually costs us to leave the five lathes idle for a couple of days."

"It's idiotic, Al. All right; so we don't need more parts right now; at least you could put something else into production."

"We'd still have the storage problem, Ed. The cheapest answer, at least this time, is to idle the machines. After all, we're not wasting the labor force if you can keep them busy."

"I'll tell you one thing, Al; we're not getting much use out of those lathe operators. They're machinists, not pressmen. If we get two man-days a day out of the five of them, we'll do OK."

"Even so, Ed; it's all figured out."

"It looks like we'll be working for an adding machine soon."

• • •

***SOMETIMES** Linear Programming comes up with answers that don't look sensible. Is Ed right in sticking to the old keep-the-machines-working idea, or are there facts to back up Linear Programming? Your opinions may help others. Discussions of earlier topics start on page 212.*

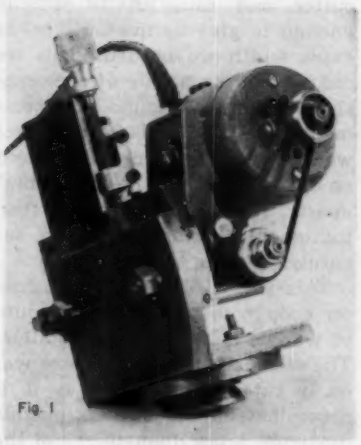


Fig. 1

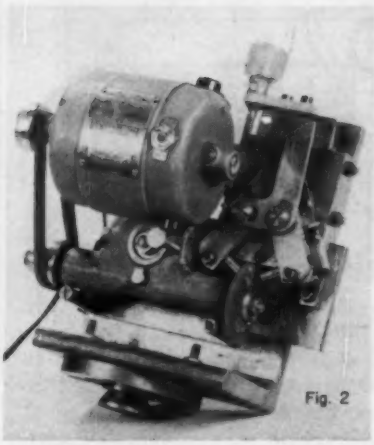


Fig. 2

Thread-Grinding Attachment Uses Toolpost Grinder

During World War II, when the best quoted delivery on special fine-thread taps was intolerably slow, the illustrated thread-grinding attachment was designed and built. Since then, many accurately ground threads have been produced with it. It incorporates a small toolpost grinder, the Dumore No. 14, but by some slight alterations other makes may be utilized.

Referring to the photos, Fig. 1 shows the side of the attachment facing the operator during operations. It shows how a piece of heavy angle plate, bolted to a compound index plate, supports the attachment and makes helix angular adjustment possible. The upright edge of the angle plate is zero-marked with +10 –10° on either side of the zero. The motor-mounting plate is marked off in 30′ increments on each side of the zero setting.

Fig. 2 is a view of the working side of the attachment. The motor is mounted on the plate with a horizontal stud. Two stop pins prevent grinder from shifting. A dovetailed slide carrying the dresser unit is also mounted on this plate, directly above the grinding wheel.

The dresser unit consists of two guides, each at 30° to the plane perpendicular to the grinder axis. These guides carry the slides to which the mounted diamonds are secured by the clamping action of shoulder screws, making adjustments easy. Both slides have shoulder screws which are linked by a bell crank. The crank pivots on one of these screws, while the other screw rides in a slot in the crank.

A stud in the side of each slide serves to limit slide motion. Limits are established by the heads of the two guide-mounting bolts between which the studs are working. Knurled-head screw, seen mounted on top of the dovetail guide, raises and lowers slide, providing the feed required to dress the wheel. Fig. 3 shows grinder removed exposing mounting post and pins.

Fig. 3

As the device was specifically constructed for grinding some urgently needed fine-pitch threads from solid stock, no provision was made for longitudinal adjustment. Had we known how broadly useful it later would prove to be, we would have built it with such adjustment or made provision for mounting on the compound.

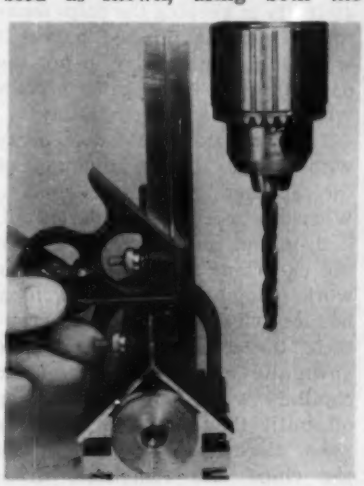
Lew Suverkrop, Bakersfield, Calif

Combination Square Aids Accurate Cross-Drilling

We use the illustrated setup for locating a drill to produce a hole accurately on the diametral line of a piece of cylindrical work.

The work is first laid out and centerpunched in the correct location on the shaft. It is next clamped in a V-block with the center-punch mark approximately at top-center position.

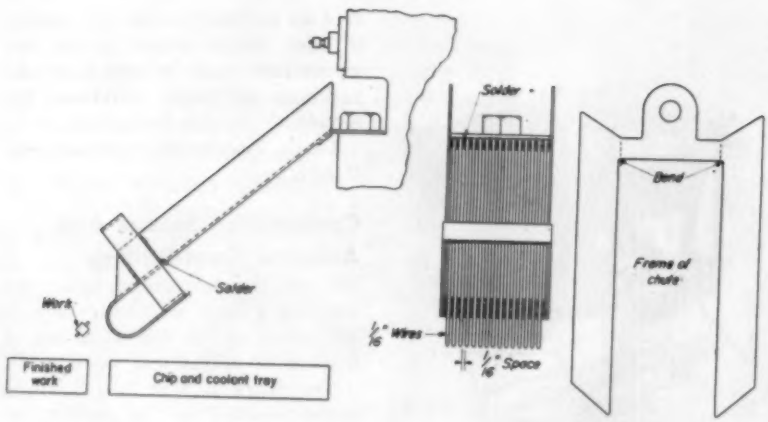
A combination square is assembled as shown, using both the



square head (containing a spirit level) and the centering head. The centering head is straddled on the shaft, and the scale brought in contact with the work and locked.

The shaft is now rotated in the V-block to bring the center-punch mark coincident with the inner edge of the scale and the bubble in the level to central position. The V-block clamp is tightened, and the hole is drilled at the center-punched location. Before this method is used, it would be well to check the drillpress table to make sure it is level.

H J Gerber, Stillwater, Okla



Separator Chute Delivers Clean Parts

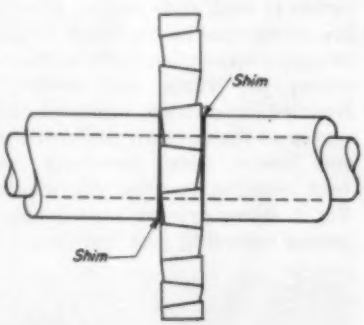
One of the problems in screw-machine and turret-lathe work is the difficulty in keeping the chips separated from the finished parts. It is sometimes necessary to put the parts through a separator process which means another handling.

The separator chute does away with all this. It takes advantage of the capillary action of the coolant. When the workpiece is parted off, it drops on the chute along with the chips and coolant. While the work, being heavier than the chips, bounces clear and into its receptacle, the chips and coolant slide down the smooth surfaces of the capillary wires and will not drop off until they have rounded the bend. Here gravity takes over and the chips and remaining drops of coolant drop into a strainer-equipped container.

The frame of the chute can be made from either sheet brass or steel. The upper end is cut and drilled to form a loop for bolting to the machine under the work. The lower end of the chute frame is open, eliminating obstructions. Dimensions may vary according to requirements, though the main point is to use 1/16 in. steel wires for the bottom of the chute, spacing them 1/16 in. apart. We are using 15 of these wires, which makes a chute 2 in. wide.

To assure uniformity in the length and bend, some method of holding dimensional consistency should be used. It is important that the wires be straight and smooth. A box-shaped clip is made and soldered to the sides of the chute to add rigidity and to secure the short ends of the wires. The long ends are soldered to the top edge of the chute.

George Aitken, Burnside, Rutherglen, Scotland



Cutter Runs Oversize With Help of Shims

Recently we had a few castings which had to have a 0.570- to 0.580-in.-wide groove milled across a machined face on each. It was a rush job so there was no time to order a cutter of the proper width.

Two passes with ½-in. or ⅝-in. cutters were first considered. Instead, we thought we'd try a ⅝-in. cutter and cause it to wobble enough to give us the 0.010 in. of extra width we needed. This we did by making a pair of crescent-shaped shims (we found by experimentation that 0.002-in. shims were right). The shims were placed on opposite sides of the cutter, 180° apart. The arbor nut was then tightened, holding the shims securely.

This effectively cocked the cutter enough to produce the amount of wobble desired during rotation. The selection of shim thickness was on a cut-and-try basis, as it is dependent on the cutter's outside diameter, arbor diameter, fit of the arbor spacers to the arbor, and compressability of the shim stock.

Finish of the cut was excellent, and all parts were within size. This is obviously not a production set-up for continuous use, but is useful for those emergency jobs.

Buckley Sullivan, Cleveland, Ohio

DO'S and DON'TS for PORTABLE ELECTRIC TOOLS

DO . . . connect ground wires properly before using the tool, to protect against accidental shock.

DO . . . be sure that the extension cable (when needed) is large enough to carry the current without too great a drop in voltage.

DO . . . see that plug and receptacle make good contact.

DO . . . use the tool handle when moving the tool. Dragging the tool by cable, even for short distances, may damage cable and may crack tool housing.

DON'T . . . overload tool capacity.

DON'T . . . flick switch on and off if tool fails to start. Remove it from work and start again with light pressure.

DON'T . . . hang tool by the cable or leave it on a wet or oily surface while not in use.

Frank L Rush, Columbus, Ohio

JOHN HORAN
Croydon, Surrey, Eng

won **$25** in addition to regular payment for his idea:

TAILSTOCK TOOL CUTS INTERNAL GROOVES

In the July 15, 1957 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

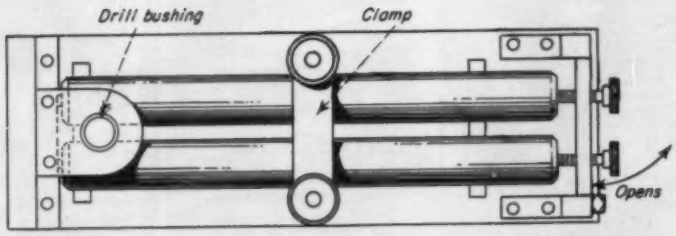
GRAND PRIZE OF $100.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.



Fixture Doubles Pinch-Bolt-Slot Output

The conventional method of using a convex cutter in a milling machine to produce pinch-bolt slots is all right if only a few pieces have to be turned out. But should the output resemble mass production, the illustrated fixture will save a lot of time and will relieve the milling machine for other work.

This fixture is used in the drill-press and produces two slots in one operation. Its open design makes for quick and easy loading and unloading.

No dimensions are given because the application for this type of fixture can be extended in many ways. One method of positioning and clamping is shown to demonstrate the process.

These shafts had been machined on centers, a feature we took advantage of when nesting the parts. The stationary upright, at the left in the drawing, carries two center points located to space the shafts properly. The upright at the opposite end is actually a gate which swings open for loading and unloading. This gate has two adjustable center points.

Two parallels are secured to the base. These can be straight or cradle shaped. If they are cradles, the center points can be replaced by plain stops. A swing clamp holds the shafts and prevents their shifting.

Locating the drill bushing is no less critical than spacing the shafts. This has to be done with a view of getting an equal amount of bite on both shafts. A plate bolted to the stationary upright carries the drill bushing.

After two shafts have been nested, a flat-bottom drill of proper size is entered into the bushing and slowly and carefully fed into the work. (An end mill with more than two flutes may be even better). In less time than it takes to mill a slot by the conventional method, two are produced by this fixture.

Lee O Calowell, Tulsa, Okla

Surface Grinder Trues Oilstone

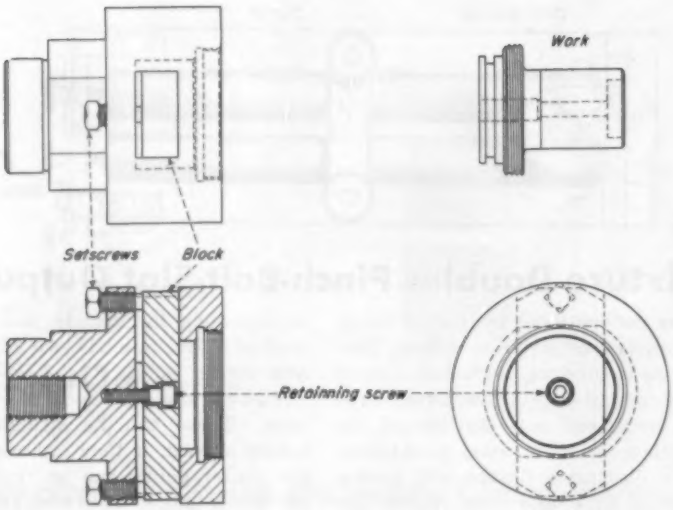
An oilstone which is badly hollowed or loaded with metal particles can be reconditioned by the illustrated grinding setup.

The oilstone is secured to the magnetic chuck of a surface grinder by nesting it between two parallels, which are held together by a toolmaker's parallel clamp, as shown. Parallels and clamp must be below the surface of the oilstone.

Repeated light passes under a coarse open-structure grinding wheel will quickly produce a clean, perfectly flat surface. A plentiful supply of coolant must be used, and the wheel should be dressed before beginning the job. Fast work traverse will help in keeping the wheel sharp.

H J Gerber, Stillwater, Okla

Practical Ideas



Turning Fixture Will Not Jam Parts

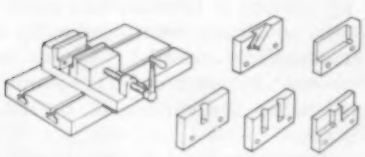
We had a considerable number of parts requiring a second operation to machine a thread concentric with a previously turned pilot diameter and thread. Heavy roughing cuts would jam the workpiece in the fixture so tightly that removing the part without damage to the newly cut thread became a problem.

Our solution was to mill and shape a rectangular slot through the fixture. We inserted a hardened and ground block which could be clamped tightly against the front face of the slot with two dog-point setscrews. The part seats against this block during the turning and threadcutting operations.

Before the work is inserted into the fixture, the two setscrews are tightened to force the block against the front face of the slot. The work is then loaded and machined as usual.

After all machining has been completed, loosening the setscrews removes the backing force and allows easy removal of the workpiece. A centrally located capscrew retains the block when the backup screws are loose. Proper care must be given to squareness between the face of the block and centerline of the fixture.

Otto Krajcovic, Lynhurst, Ohio



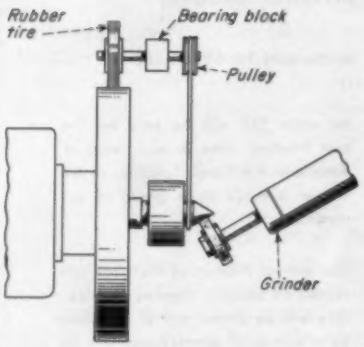
Soft-Jaw Pads Double As Milling Fixtures

Illustrated are a few of the soft-vise jaw pads we have on hand. Their use, in place of the standard heat-treated jaws, adds up to much time saved on short-run small-piece milling jobs. They are valuable also when reorders must be quickly processed. The idea stems from soft lathe jaws that we apply to a milling machine vise as follows:

A standard vise is set up on a vertical mill table and indicated true. The heat-treated jaw pads are removed, and if the stationary and movable jaws have relieved faces they are milled straight. A number of soft pads are made from CRS flat stock and suitably drilled for fastening to the vise jaws.

Angles, aligning flats, or spaced slots to fit the individual job can now be milled into these pads as required. The forms to locate the workpieces may be milled in one or both blanks. These jaws, when carefully made, are numbered and stored for repeat jobs.

C B Voege, Indianapolis, Indiana



Live Center Ground On Its Own Bearings

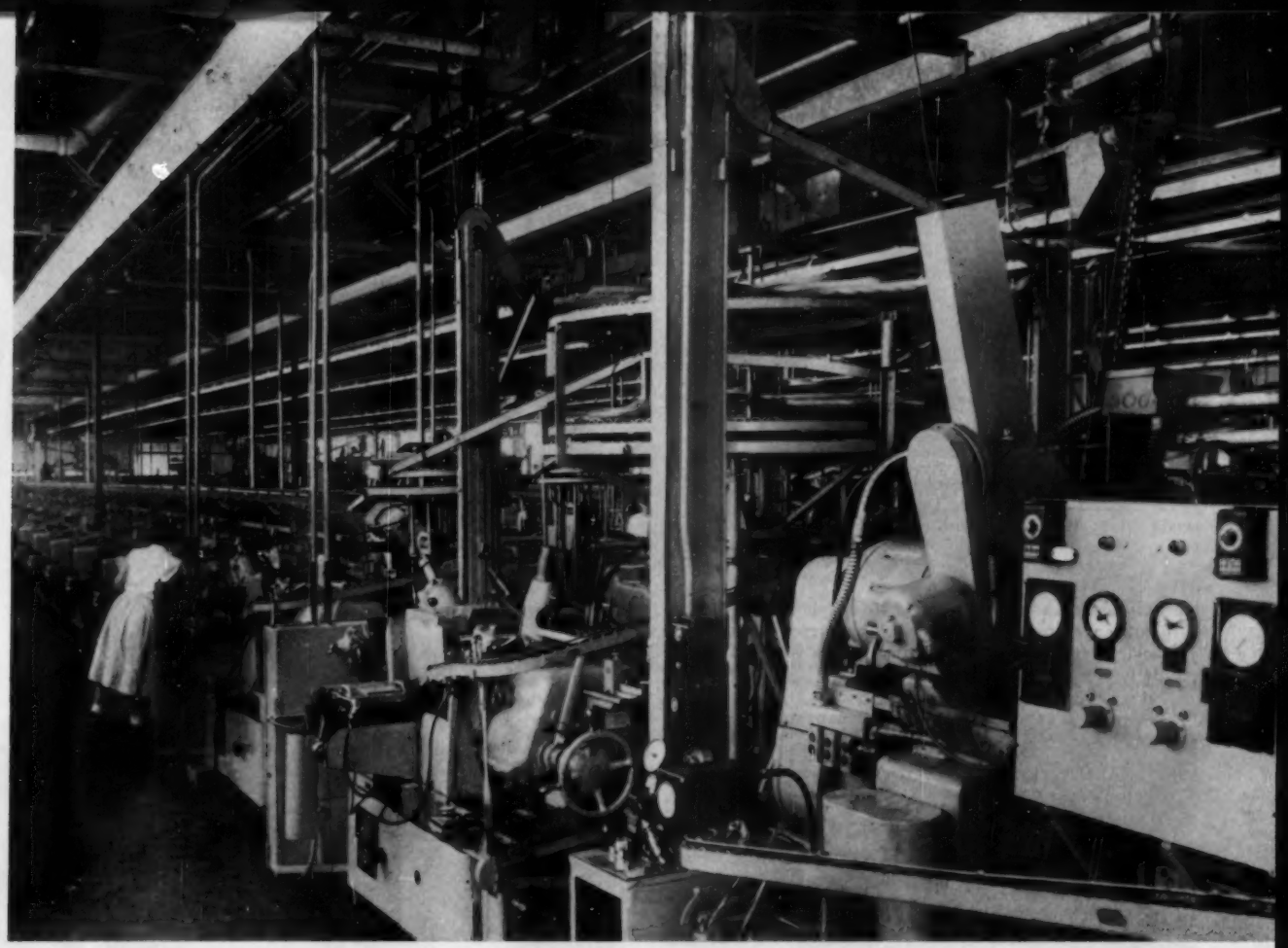
A large number of ball bearing "live" centers are used in our plant. They are returned periodically for installation of new bearings. After installing the bearings, a regrind of the center point is desirable to insure concentricity.

To make this operation as painless as possible, we made a fixture designed to rotate the center point with power takeoff from the lathe. It consists of a shaft running in a bearing block with a pulley on one end of the shaft and a rubber-tired wheel on the other. The fixture mounts on the lathe bed in back of the faceplate as shown.

The rubber wheel is adjusted to bear on the periphery of the faceplate. A small round belt runs from the pulley to the center-bearing housing.

A toolpost grinder is mounted on the compound, which has previously been set to the angle required. As the faceplate is set in motion (at a very low RPM), the grinder is fed to the center point, taking only light cuts with each pass. This method erases errors and produces a true-running center.

Clifford Molloy, Bronx, NY



No. 1 cup line at Timken's Bucyrus, Ohio, plant is typical of the 11 machining lines and of the degree of mechanization in...

America's "Automatic Factory"

ANDERSON ASHBURN, managing editor

Direct comparison between US and Russian production methods is now possible with the unveiling of Timken's Bucyrus plant. Here is that comparison, the details on this US plant producing 30 million bearings a year, and the development of the "Bucyrus Concept"

In a highly mechanized plant, located in a former cornfield in Ohio, the Timken Roller Bearing Co has produced more than 167 million cups and cones for tapered roller bearings. Because of the publication in *American Machinist* of a detailed description of two highly mechanized bearing lines in Moscow (Russia's "Automatic Factory," *AM*—Jan 14 '57, p147), Timken opened this Bucyrus facility to the press on exactly the same basis that the Russian plant had been opened to our overseas correspondent.

The visitors to Timken were permitted to go anywhere in the plant, ask any questions, take any pictures they wished. Everyone at Timken was unusually frank and open in talking about the operations at the plant. They indicated, however, that one reason for their openness was that further improvements, now in the pilot stage in Canton, will further reduce the cost of producing bearings below the present level.

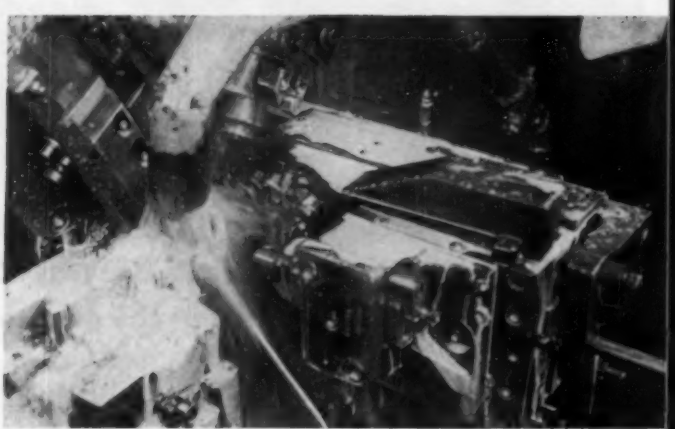
At present, Timken bearings produced at Bucyrus sell for 15% less than comparable sizes produced in other Timken plants. The company expects eventually to increase this differential to 25%.

The new concept had its start in selling the customers in the automotive industry on standardizing their requirements and the production of these limited sizes at unprecedented production rates in as mechanized a plant as possible. Of the 45 cups and cones now produced at Bucyrus, 80% of the production is concentrated in 14 items. If increased production will permit concentration entirely on these sizes, so that fewer line changes are required, further economies will be possible. At pres-

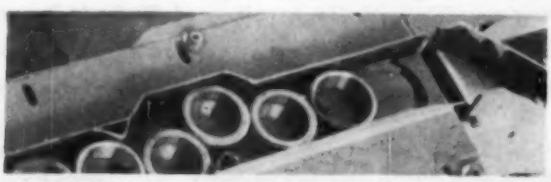
ABOVE: Tools are preset in holders for the screw machines. Here two radius tools mounted in a single holder are set on a J & L comparator in the toolroom

RIGHT: Central storage units in finishing department supply grinding wheels, honing tapes, diamond holders, other frequently required service items. Unit is resupplied from storeroom every 4 hr

Stubby design of screw machines was developed to save floor space. Stock racks hold 8-hr supply of bars, which load automatically when attendant removes butt end of previous bar. Timken-developed collets permit automatic chucking with hot-rolled bars. Belleville springs compensate for variation. maintain constant chucking pressure on the hot-rolled bars

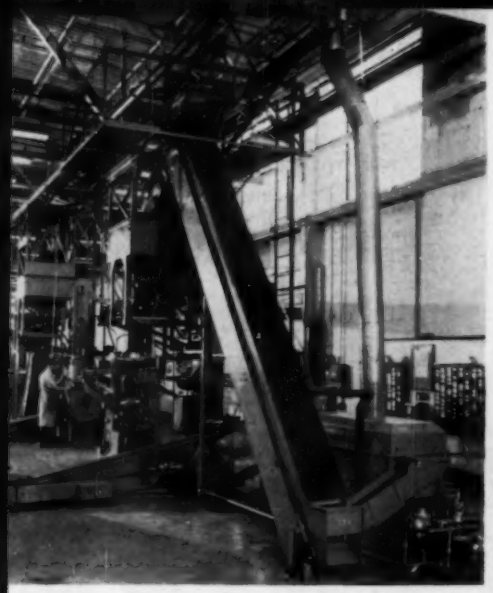


30% increase in output of screw machines was made possible by hydraulic system that provides quick removal of end slide just before cut-off is complete. Pickoff rod advances from below end slide to catch the cup as it falls from the end of the bar and feeds it to start of continuous conveyor system. End slide re-engages with machine camming at the start of next cycle

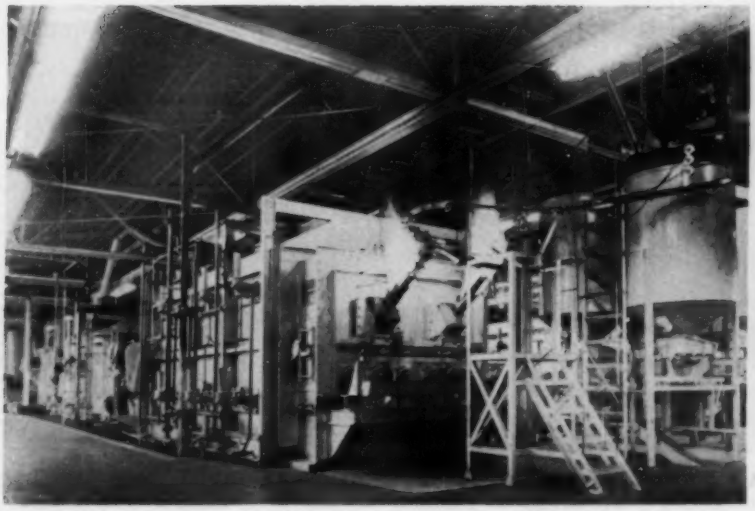


ABOVE: Cup turner was developed to orient parts after conveyor transfer when they must be loaded into machines with proper orientation. Cups traveling thin edge down drop through crescent slots, turning 180° as they drop

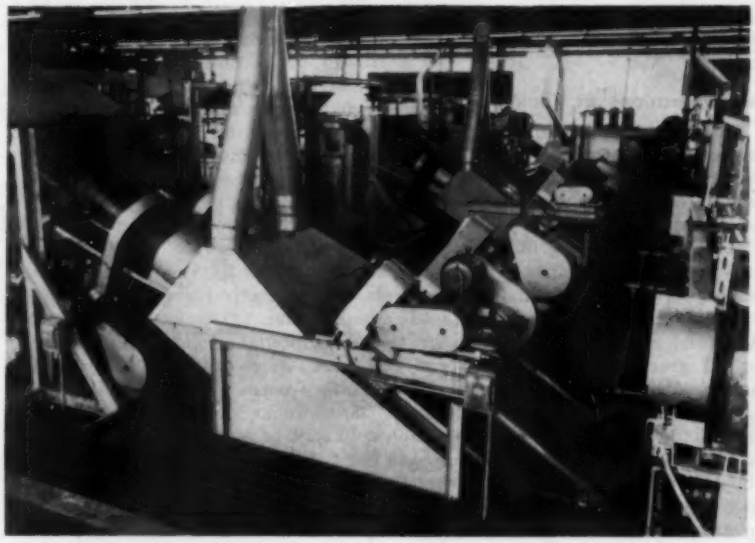
LEFT: Start of cone lines is at row of 4-spindle Conomatics along the right. Cones are spot checked on Kodak contour projector in the aisle. From pickoff bars on the automatics, cones are conveyed overhead to line of chamfering machines and presses (where part number is stamped) along left side of aisle



Conveyor system at the end of the green machining lines is typical of the plant. Cups come from the automatics on floor-level belt conveyors, through a washer, up the elevator to a storage bin, into a rotary feeder, and through a device that turns cups over when necessary to orient them for the marking and chamfering machines in background



One cone heat treating line shows carburizing, hardening, and tempering furnaces. Large storage bins at right hold work from green machining (5-day week) and feed it to furnaces (7-day week). Two bins are required for each furnace line so separate storage can be provided when changing from one cone size to another



Double spiral conveyors bring cones up from quench tanks after carburizing and feed them to washers. A second set of spiral conveyors lead from washers into hardening furnaces

ent, the bearings from this plant are used on every American make of car except Buick.

US and Russia Compared

The two Moscow lines make the rings and assemble two standard series of ball and roller bearings. The Timken plant makes 31 sizes of cups and makes and assembles 14 sizes of cones. In both cases, rollers and cages are made elsewhere.

There are 127 machines in the Moscow plant: 70 metal cutting, 7 presses, and 50 grinders. There are 257 machines in the Timken plant: 50 screw machines, 33 machines for chamfering, marking, and other operations, 134 grinders, and 40 honing machines.

Production is 1.5 million per year (900,000 ball bearings and 600,000 tapered roller bearings) in Moscow. It is about 30 million per year (33 million cups and 27 million cones) at Bucyrus. Tolerance control in the new Timken plant makes selective assembly unnecessary, so cups and cones are produced, packed, and shipped separately.

W E Umstattd, president of Timken, calculates from the data in the *American Machinist* article that the Moscow plant produces 35 bearings per man per 8-hr shift. The Bucyrus plant produces 192 bearings per man per 8-hr shift.

The Moscow plant has 21,526 sq ft (part of a larger plant); Bucyrus has 180,000 sq ft. Moscow has 178 people on two shifts; Bucyrus has about 700 on three shifts, with 148 workers per shift, not including the toolroom, but including foremen.

There are many similarities in the operations in the two plants. Both use carbide tooling exclusively, neither uses feedback on any machine, both use automatic gaging, both use centerless grinding, both external and internal.

There are also marked differences: The Moscow plant makes both cups and cones from chrome steel blanks, which are turned in automatic lathes. Timken starts with hot-rolled bars of a nickel-moly steel and does all the green machining (that done before heat treat) in 1- and 4-spindle bar automatics except for a chamfering operation after the blank is cut from the tube.

Assembly of tapered roller bearings is in a 4-station automatic machine in Moscow, while at Bucyrus the cage is placed in the machine by hand, the rollers are inserted automatically, and then the cone is in-

Automatic loader for No. 2 Cincinnati centerless grinder provides continuous feed of cups through the grinder. A side tooth pushes the stack along on work rest while center plunger retracts so a cup can drop on end of line from conveyor. Then plunger pushes the stack while side finger retracts to catch stack behind new part

serted by hand and the assembly transferred to a press that forms the cage to make a permanent assembly.

Key Operations at Timken

The "Bucyrus Concept" began to develop right after World War II, and to date some $12.5 million has been invested in the plant and equipment, not counting the money and effort that went into inducing the auto builders not to use a different bearing on every model and line.

Tests with carbide tooling led to the decision to use carbide tooling for all green machining. No screw machines then existed that were designed for carbides and Timken financed the research of machine tool builders to develop the machines. Short stroke machines were developed (conserving floor space) that operate at 485 sfpm. One saving is that the carbide cutoff blade on the 2-in. machine saves 1/16 in. of tubing per cup. At 1-million cups per month from this line, this adds up to a mile of tubing saved per month.

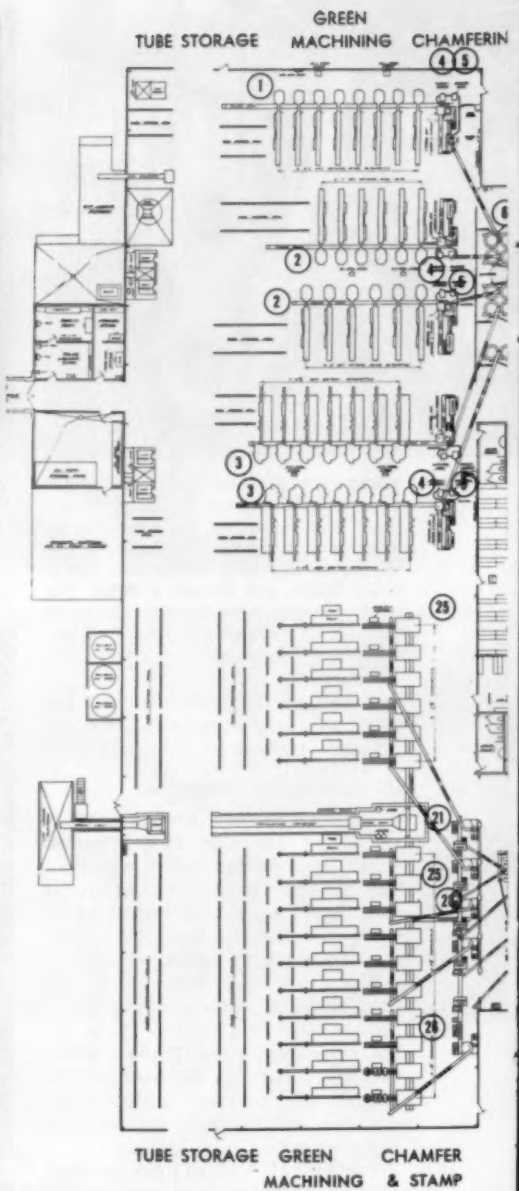
Hot-rolled tubes save $2 to $4 per tube over the conventional cold-finished tubes, but they vary as much as 0.060 in. in the larger sizes. Therefore, when hot-rolled bars are chucked, collet tension must be adjusted. To avoid this, chucking devices were developed for all the automatics that employ Belleville (dished washer) springs. These springs can have a flat load-deflection curve over a considerable range and provide virtually constant chucking pressure over the tolerance range of the hot-rolled tubes.

All machines have quick disconnects on electric, hydraulic, and pneumatic connections. If a machine should break down, it can be disconnected, removed from the line, replaced with another machine, usually in a matter of minutes. However, a scheduled overhaul on machines, copied from the methods used for aircraft engines, makes a breakdown on the line a rare occurrence. At regular intervals, machines are removed from the line and returned to the toolroom for complete overhaul. Other scheduled adjustments and maintenance operations are performed on a daily, weekly, and monthly basis.

Stock racks for the screw machines hold an 8-hr supply of tubing. When the tube in the spindle is used up the machine stops with the collet open. An attendant removes the butt end and presses an air valve that releases the next tube. It rolls into the cradle and is pushed by a ram into the spindle until the forward end hits the stock stop. The spindle closes and the machine starts automatically.

To reduce downtime, the tools are ground and preset in holders in the toolroom. Toolholders are changed on a scheduled basis without waiting for the tools to dull.

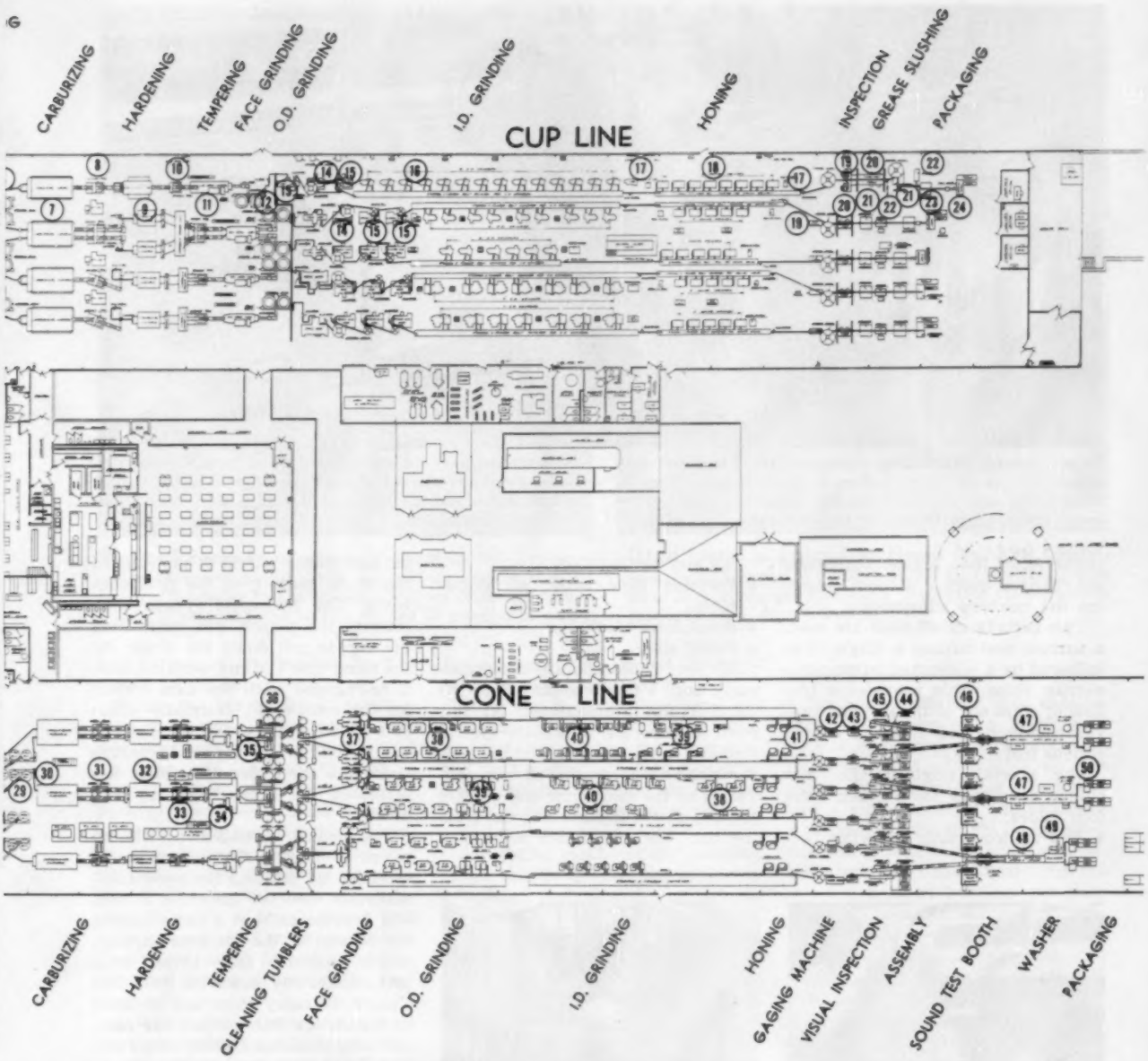
To permit pre-set tools on lines that handle more than one part, all screw machines were designed with double adjustments. One set of adjustments is provided in the toolholders, while a second set is provided on the slides. When changing a line from one part to another, the set-up is made by adjusting the



This setup

Cup Lines

1. 8—2½-in. SST National Acme single-spindle automatics
2. 12—3-in. National Acme single-spindle automatics
3. 14—4⅝-in. New Britain automatics
4. 5—Schmidt markers
5. 5—chamfering machines
6. 10—storage bins
7. 4—Surface Combustion carburizing furnaces
8. 4—washer tanks
9. 5—Surface Combustion hardening furnaces
10. 4—washer tanks

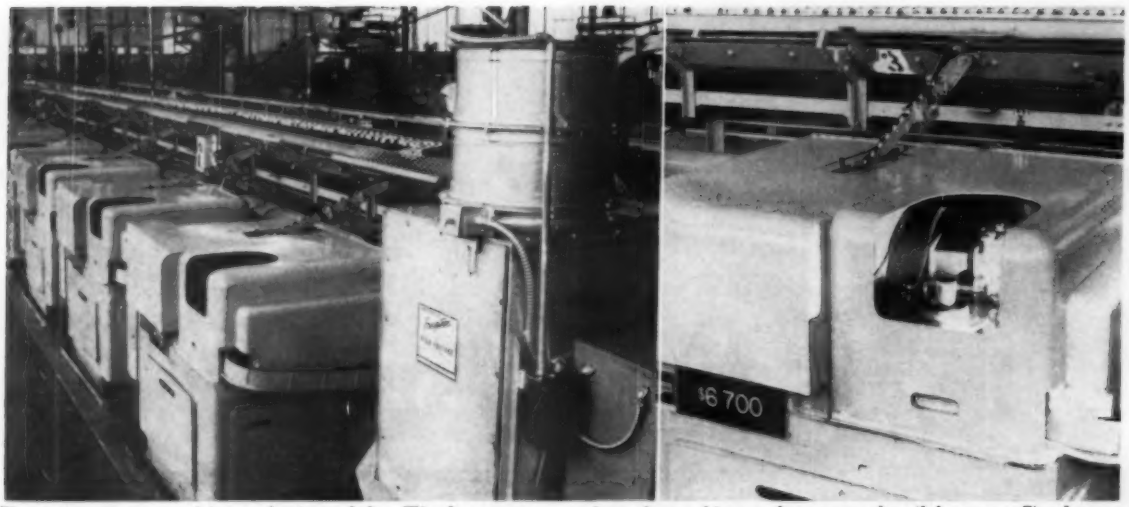


produces 30-million bearings a year . . .

11. 4—Surface Comb. air-draw furnaces
12. 10—storage bins
13. 5—Gardner face grinders
14. 5—No. 2 Cincinnati centerless rough OD grinders
15. 9—No. 2 Cincinnati centerless finish OD grinders
16. 43—Heald centerless ID grinders
17. 9—Precipitrons
18. 28—tape honing machines
19. 6—Moore air gages
20. 6—visual inspection tables
21. 5—washers
22. 5—driers
23. 5—slushers
24. 5—wrapping machines

Cone Lines

25. 12—2⅝-in. 4-spindle Conomatics
26. 4—1½-in. 4-spindle Conomatics
27. 6—3½-in. Conomatic chamfering machines
28. 5—No. 6 Minster presses
29. 10—storage bins
30. 3—Surface Combustion carburizing furnaces
31. 3—wash tanks
32. 3—Surface Combustion hardening furnaces
33. 3—wash tanks
34. 3—Surface Combustion air-draw furnaces
35. 3—Almco cleaners
36. 12—storage bins
37. 5—Gardner face grinders
38. 24—Cincinnati OD grinders
39. 14—rib grinders
40. 29—Heald Model 190 ID grinders
41. 12—tape honing machines
42. 6—Moore gaging machines
43. 6—visual inspection stations
44. 6—assembly machines
45. 6—close-in presses
46. 6—sound test booths
47. 2—Ransohoff washer, drier, and slushers
48. 1—Alvey-Ferguson washer & drier
49. 1—slusher
50. 6—tube loading machines



Tape honing machines designed by Timken use abrasive tape as the honing medium for 8 mu in. finish. Tape is advanced for each cup so that a new abrasive surface is presented for each part. Precipitron in foreground collects oil mist from the machines and separates the oil for reuse. Circular conveyor distributes parts to all eight machines, with parts going around and around the circuit until there is an opening at one of the machine chutes

slides. After that, pre-set toolblocks are changed quickly without changing the machine adjustments.

Two carbide cutoff tools are used, a narrow tool cutting a single chip, followed by a wider tool cutting two narrow chips. This provides a free flow of chips out of the slot and prevents jamming that formerly caused serious tool damage.

The special single-spindle machines developed for Timken have four slides:

- End-working slide carrying boring and turning tools
- Forming slide with two radius tools
- Breakdown slide
- Cutoff slide

All four slides operate simultaneously until a few seconds before the cutoff cycle is completed. At this point a separate hydraulic system provides quick retraction of the end-working slide. A pickoff pin advances at the same time and catches the cup at the instant it is cut from the bar. The cup slides down this pin and comes to rest at the start of the chute leading to the first conveyor. The hydraulic system then retracts the pickoff pin, permitting the cup to roll down the chute. At the same time the end-working slide is re-engaged with the cam system for the next cycle. Normally about 30% of the cycle would be required for retraction of the end-working slide, and the hydraulic system has increased the productivity by this much.

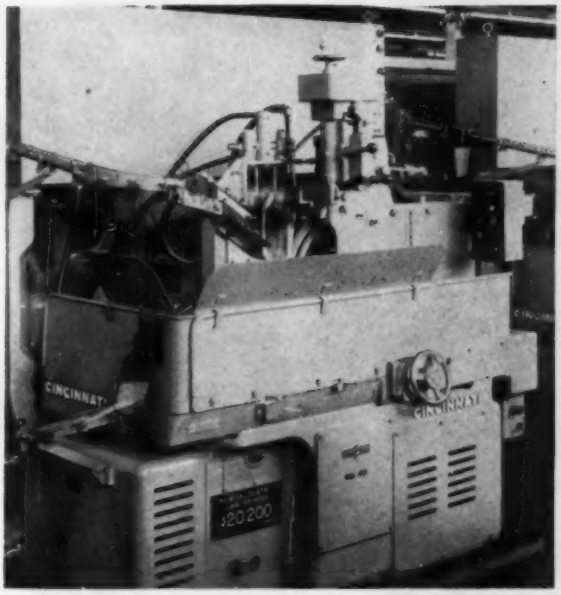
The pickoff arrangement was an essential feature both because of the need for starting the parts automatically into the conveyor system and because there is a large hole in the bottom of the machine through which coolant and chips drop into a sluiceway under the floor. The sluiceways carry chips and coolants to separators from which the coolant is recirculated and the chips carried by shaker conveyors to trucks that return them to the steel mill in Canton.

Spot inspection of ID of cup is made with Moore air gage. On critical operations, parts leaving the machines are held in storage in exit chutes until roving inspectors check the last piece in the chute. If it is within tolerance, the parts banked in the exit chute are released to the main conveyor

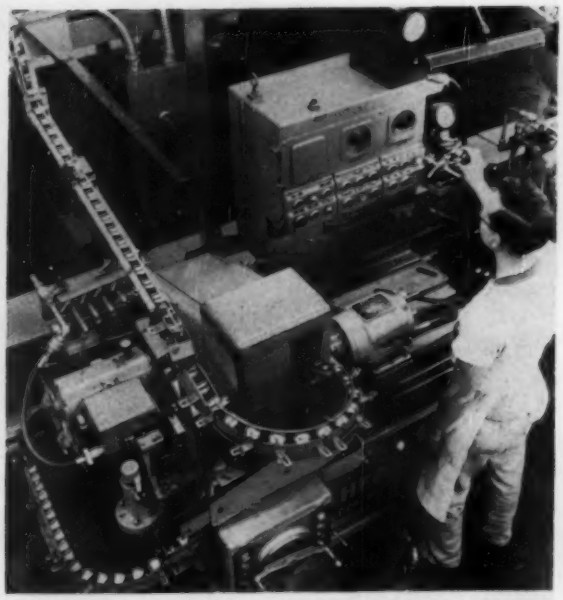
Visual inspection is given all cups after final gaging. With an artist's brush, the inspector rolls the cups (three at a time) down a double runway and checks for visual defects. After 4 hr (5000 cups), the operator is shifted to other work

Heat Treating

The furnace lines include carburizing, hardening, and tempering and were developed in conjunction with Surface Combustion Corp. The carburizing furnaces have spiral retorts and operate with an atmosphere of endothermic gas and natural gas at a positive pressure. Typical gas composition is 18% carbon monoxide, 42% hydrogen, 40% nitrogen, and 0.3% methane. Carburizing temperature is 1700 F with a time cycle of 5½ to 8 hr to produce a case from 0.025 to 0.040 in. graduated from



Tapered raceway of cones is ground in No. 1 Microcentric Cincinnati grinder. Cycle time per cone ranges from 9 to 17 sec depending on size of cone. Cones are rough and finish ground in separate machines with rib and ID grinding between



ID of cones is ground in Heald No. 190 Centrimatics to tolerance of 0.0005 to 0.0008 in. Cycle time ranges from 14 to 25 sec per cone. Gage mounted on the machine is provided to spot check tolerances

1.00 carbon at the surface to 0.20 carbon in the core.

From the carburizing furnace, parts drop into a sealed oil quench, then are picked up by another spiral conveyor and carried through a washer. Another spiral conveyor leads to the re-heat furnaces where the grain of the case is refined. These furnaces have an endothermic gas atmosphere and bring the parts to 1510 F. The smaller parts are processed through a spiral retort and drop quenched. Larger parts are handled in pusher furnaces and die-quenched five at a time at the furnace exit.

A similar conveyor system carries the parts through a washer and into the tempering furnace at 360 F.

Grinding Operations

Most of the grinders are standard machines of types designed for bearing plants, though special loading equipment had to be developed, the most interesting example of which the loading mechanism for the OD centerless grinders (see illustrations on page 156).

As mentioned none of the machines are equipped with feedback adjustment. Spot inspections are made on the machines and on critical operations the parts are held in exit chutes until a roving inspector checks the latest piece made by the machine. If it is within tolerance, the accumulation in the chute is released to the conveyor.

Since the Bucyrus lines were developed, on-machine gaging with feedback has become more common and such methods are being used on a new mechanized line for railroad bearings that Timken is setting up in Columbus.

Air gaging machines are included in all the lines after machining is completed, and other gaging stations are spotted along the line for use in spot inspections by roving inspectors.

Conveyor Systems

To provide steady flow through each operation as required, banking is provided in the conveyor system. Most of this in-process storage equipment is of familiar design, but before and after heat treating, bins are provided for bulk storage that will hold a two-day supply of parts. Thus, heat-treat furnaces can operate on a 7-day schedule while green machining and finishing operations operate on a 5-day schedule.

In the finishing departments, where a large number of machines are required to handle the load in ID grinding and honing, a circular conveyor system is used. Parts travel along the circuit above the machines and then return to repeat the circuit until an opening develops in a machine chute.

Labor Relations

No labor difficulty was encountered in developing a plant with such a high productivity level. Because the plant was built in an area where Timken had not previously had a plant, some of the problems were avoided that might be expected when a productivity level was established that is about four times the rate (in finished bearings per man per hour) obtained in the other Timken plants.

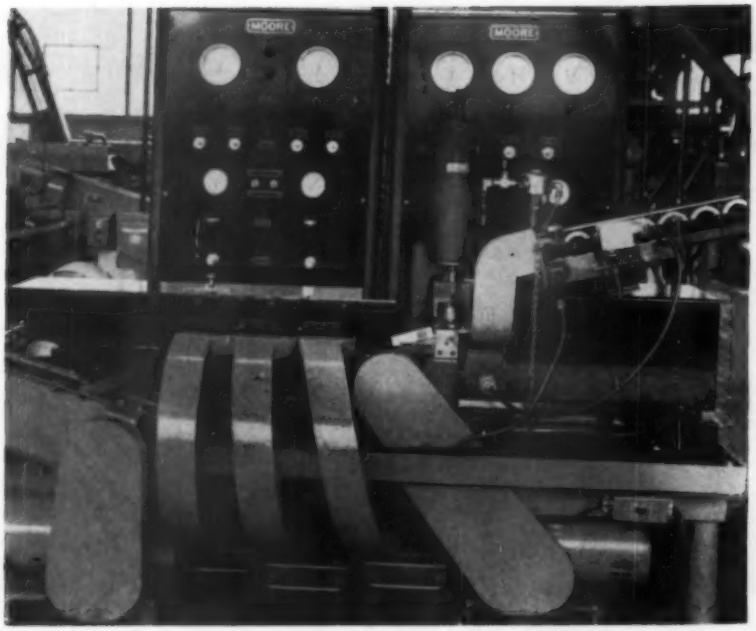
All applicants were given mechanical aptitude tests and selected with care. Average age is 29.

Each production line is divided into groups and each group is paid a bonus based on the number of pieces produced. Maintenance and toolroom employees are paid a bonus based on the production of all lines. Last year the average bonus was 25% of base pay and resulted in an average hourly rate, including fringe benefits, of $3.50.

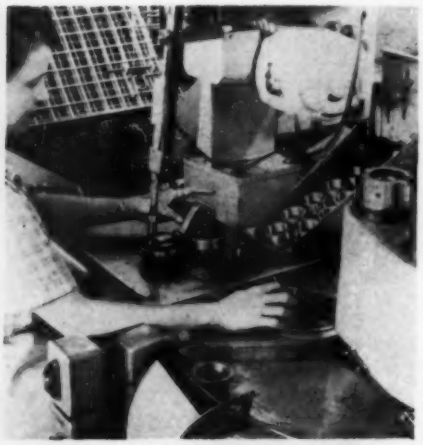
Employees are shifted from department to department on the line at intervals. This serves the double purpose of providing a flexible force and reducing the boredom that can arise in repetitive work.

Throughout the plant machines are permanently tagged with prominent signs (which can be seen in some of the pictures) giving the year of purchase and the price of the machine.

(Continued on next page)



Automatic air gage measures cone's overall length, OD, raceway stand, taper, rib length, and bore. This Moore gage checks 42 cones a minute, drops good cones on conveyor leading to assembly machine, segregates others into three classes of defect



Cone assembly feeds rollers automatically into cage after operator has placed it in rotating frame. Magnetic elevator brings rollers into the feeder tube. Cone is then inserted in cage and the assembly placed in dial-feed press which closes the cage. Electric eye trips the press when operator's hand is removed. Assembly rate runs as high as 1200 per hour

When this was first started, there was a reaction of disbelief that the machines could have cost so much. Invoices were shown to the operators and attendants and the word soon got around that the figures were honest. The posted prices have had a good effect on the care taken in maintenance of the machines.

The average investment per worker in the Bucyrus plant is $15,000 compared with $6,000 in the other plants. In comparison with the $12.5 million spent to install equipment for 11 lines at Bucyrus, the new line for railroad journal bearings is costing $7.5 million for a single line, though the bearings are considerably larger (5 to 6½ in. bores).

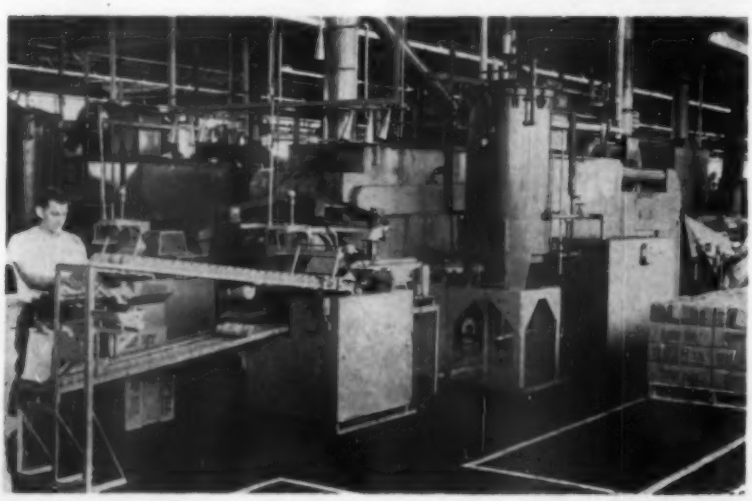
Shipping Center

Adjacent to the new Bucyrus bearing plant is an even newer warehousing facility that employs about 300 people and ships 95% of the Timken bearings produced in all plants. More than 10 million pieces are handled and shipped each month.

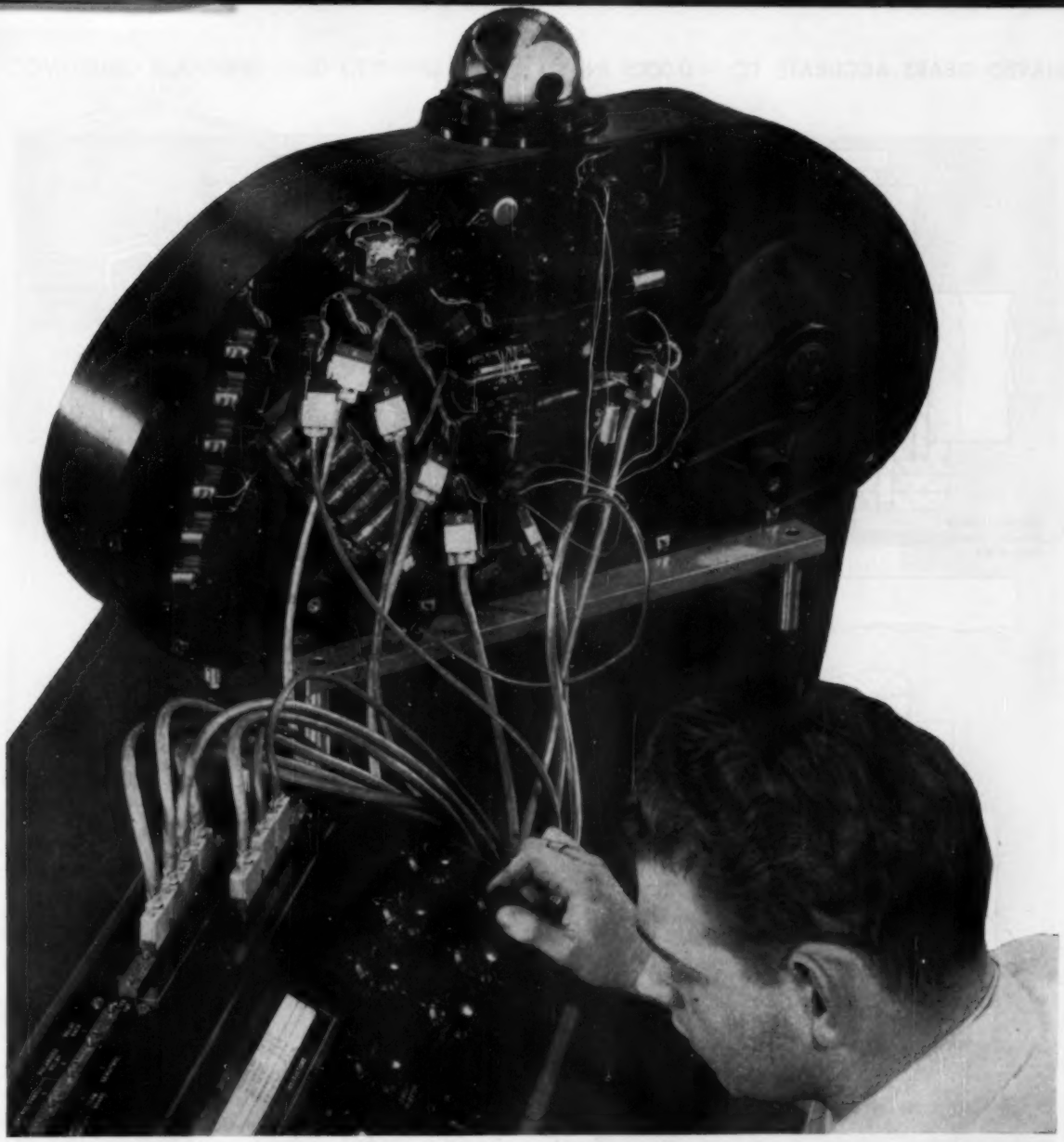
Stock is received and stored during the day shifts, using random storage with IBM card control. Also during the day orders are made up and placed on punched cards. Stock to fill the orders is collected on the midnight shift and routed to the packing tables where it is packed and shipped on the next day shift.

All inventory control, scheduled production, and unshipped orders are handled by an IBM 650 computer. Timken found it necessary to go to a mechanized distribution system because of the volume of sizes stocked and because so many customers now use closer inventory control and require closer control of shipping dates to meet their own production schedules.

Development of the "Bucyrus Concept" really started in 1947 with a rough sketch by A L Bergstrom of a conveyorized straight-line system for one size of bearings. From this beginning, the idea developed into the present plant with its 11 lines flexible enough to handle 45 different cup and cone sizes. The payoff is in the level of productivity maintained and the uniformity of the bearings that are produced.



Packaging machine packs cones, after final washing, drying, and slushing (coating with petrolatum) into cardboard tubes. Attendant places tubes in cartons. Because accuracy level at the Bucyrus plant has made selective assembly of cones and cups unnecessary, bearings need not be packaged as matched sets



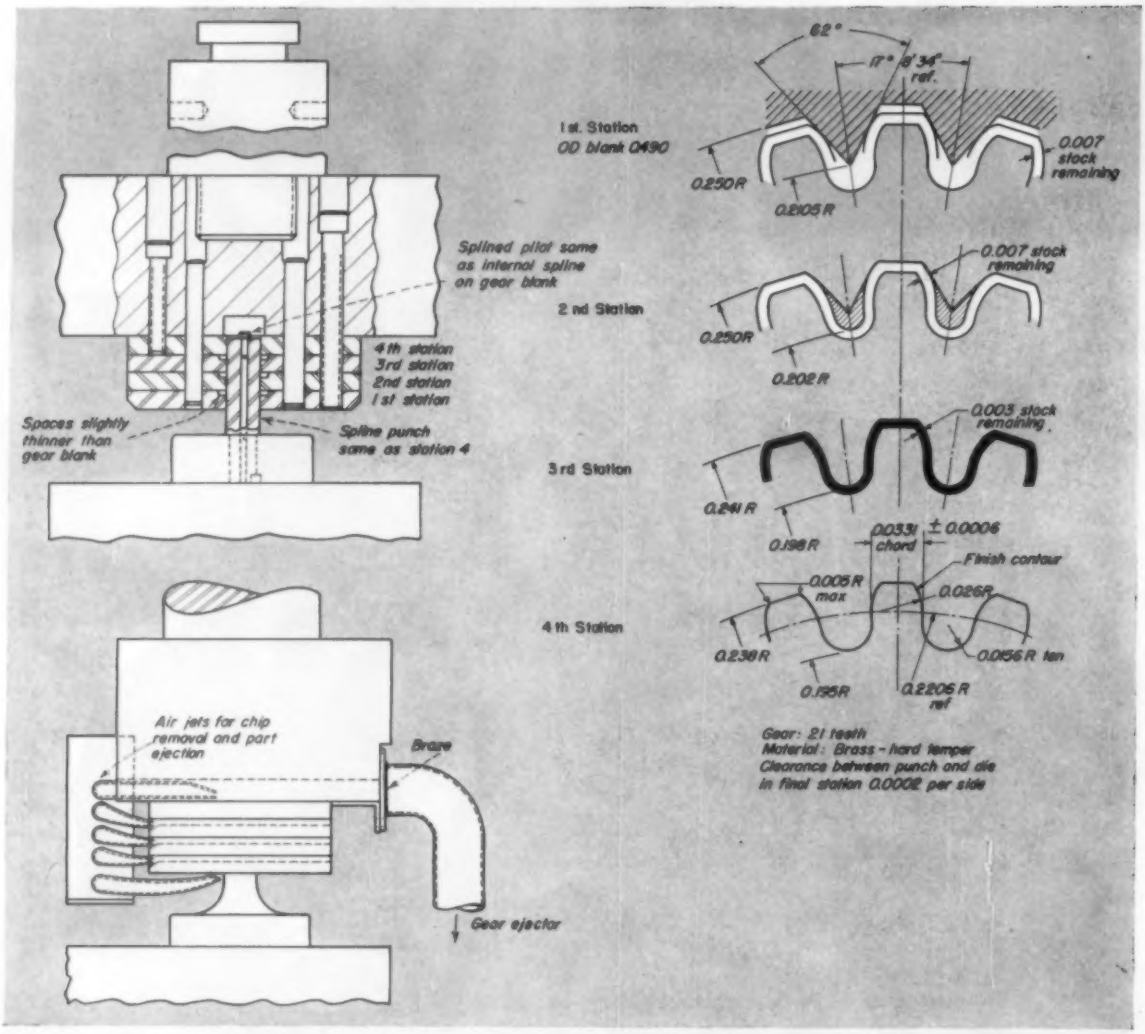
Aerial-panoramic camera . . . production engineered and built by Daco, is checked by a specially designed instrument. This instrument accurately performs 154 inspection checks to insure proper camera functioning. Some of the precision parts in camera are made from stamping dies similar to designs shown in this report

Intricate dies cut costs of precision instruments

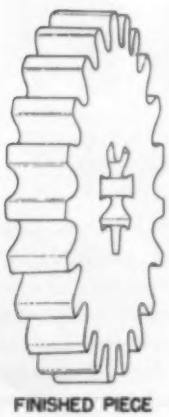
HENRY HUTZLER, plant superintendent, DACO INSTRUMENT CO, BROOKLYN, NY with JOHN P WRIGHT, associate editor

One of the most economical methods of building precision instruments by production methods is to fabricate the majority of parts from stamping dies. However, this is more easily said than done because the design of such dies requires a vast store of experience and ingenuity. Daco has acquired this knowledge over a period of 27 years and is currently concentrating on the design, prototype-making, manufacture, and assembly of precision electro-mechanical instruments. From this valuable source of information we have compiled here a series of some of their die designs and tooling methods developed for fabricating progressive, blanking, shaving, and coining dies.

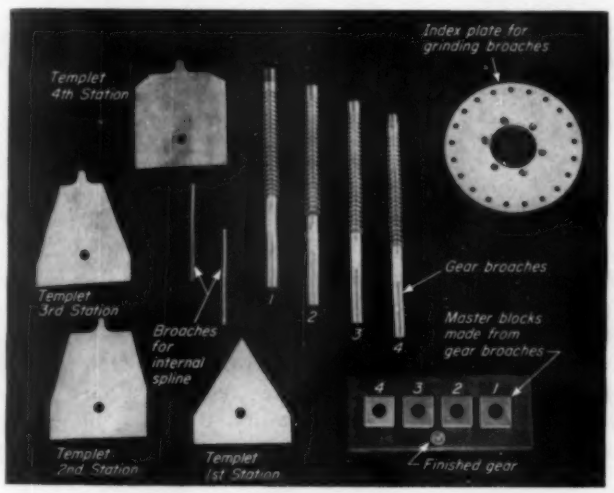
SHAVED GEARS ACCURATE TO ±0.0005 IN. . . .



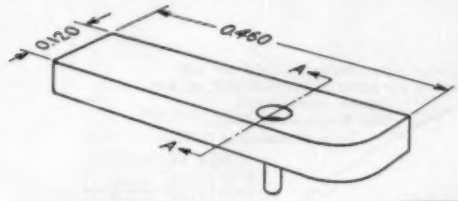
Four-station shaving die . . .
cuts gears accurate to ±0.0005 in. PD from blanks in one stroke of the press. Unique design of die that roughs, finish cuts, and shaves the gear in one cycle, has proved to be the fastest method of producing accurate gears in production lots. The gear blanks for this operation are previously prepared in a progressive die that pierces, cuts, and shaves an internal spline, then blanks


FINISHED PIECE

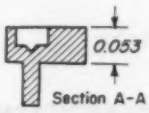
Here's all the major tooling . . .
required to fabricate vertical four-station shaving die that produces accurate gears in high production quantities. All the broaches were ground on a surface grinder using a Moore pantograph attachment

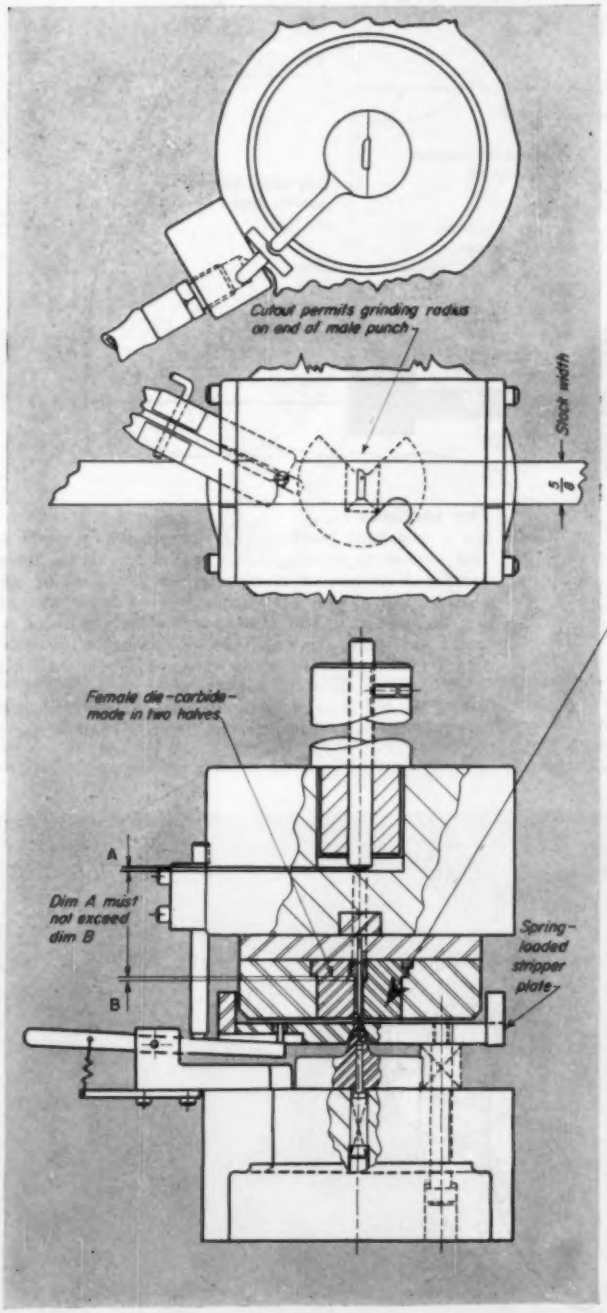


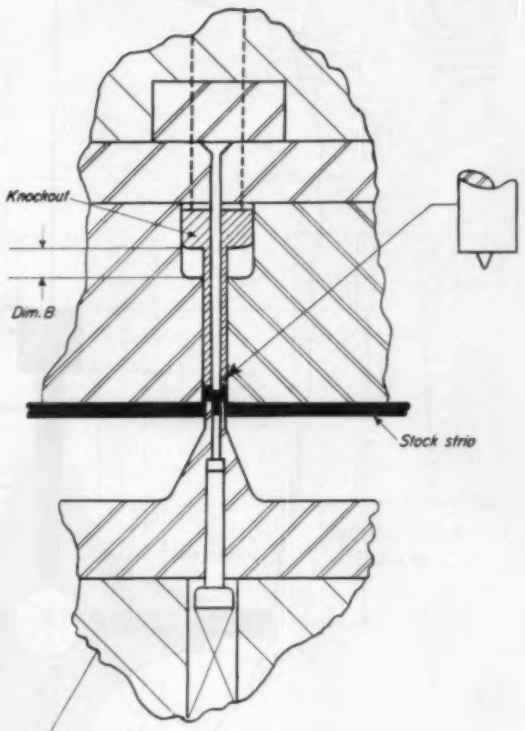
COMPOUND BLANKING AND COINING DIE . . .



FINISHED PIECE:
Material: Half-hard brass

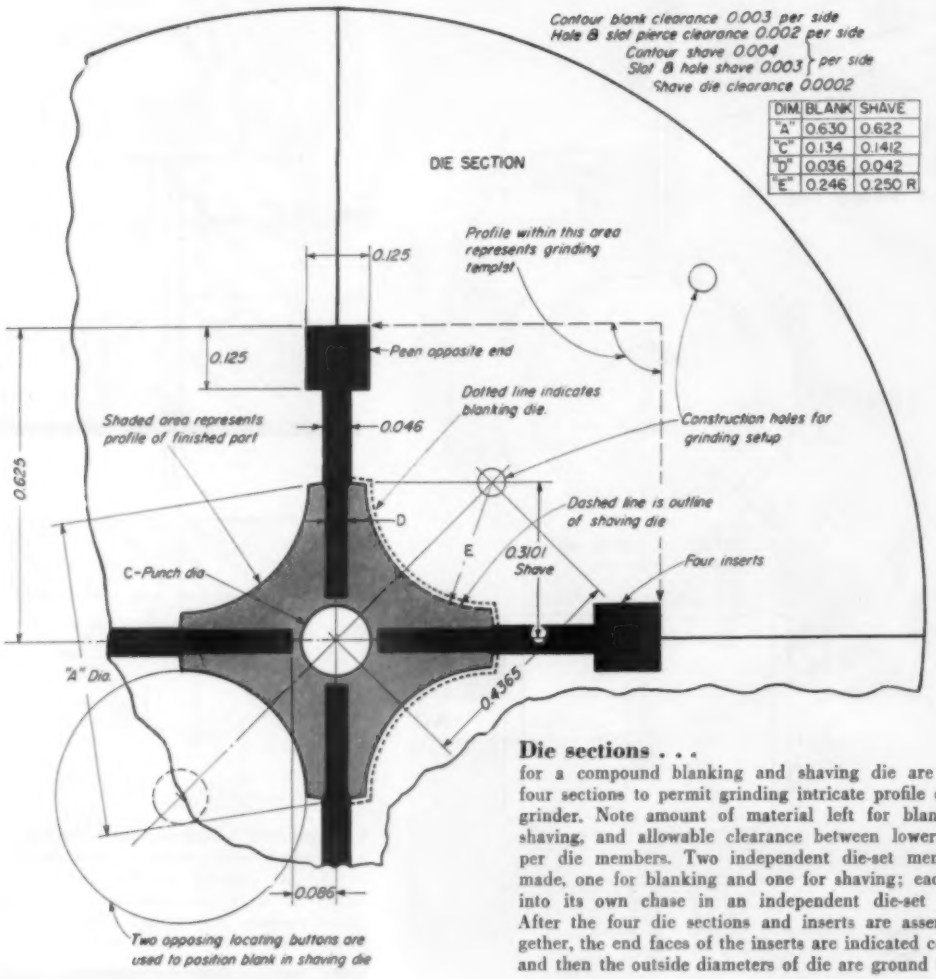






Compound blanking and coining die . . . produces a finished part with a burnished perimeter. Carbide female die is highly polished and fitted to male punch within 0.0002 in. Combination of carbide and close fitting punch produces a burnished part free of a breakout edge, and eliminates the need for an extra shaving die

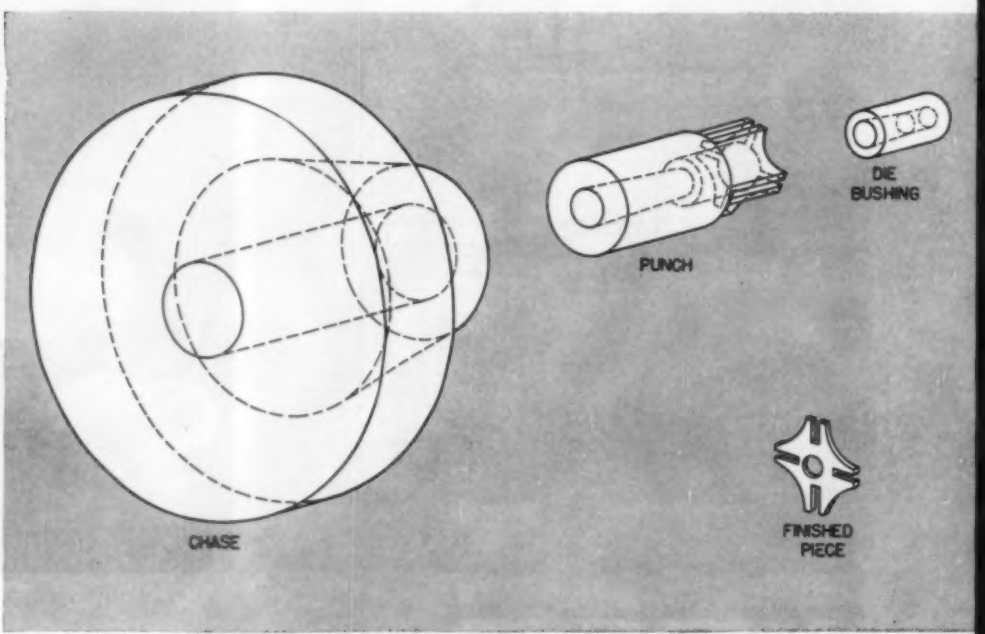
COMPOUND BLANKING AND COINING DIE . . .

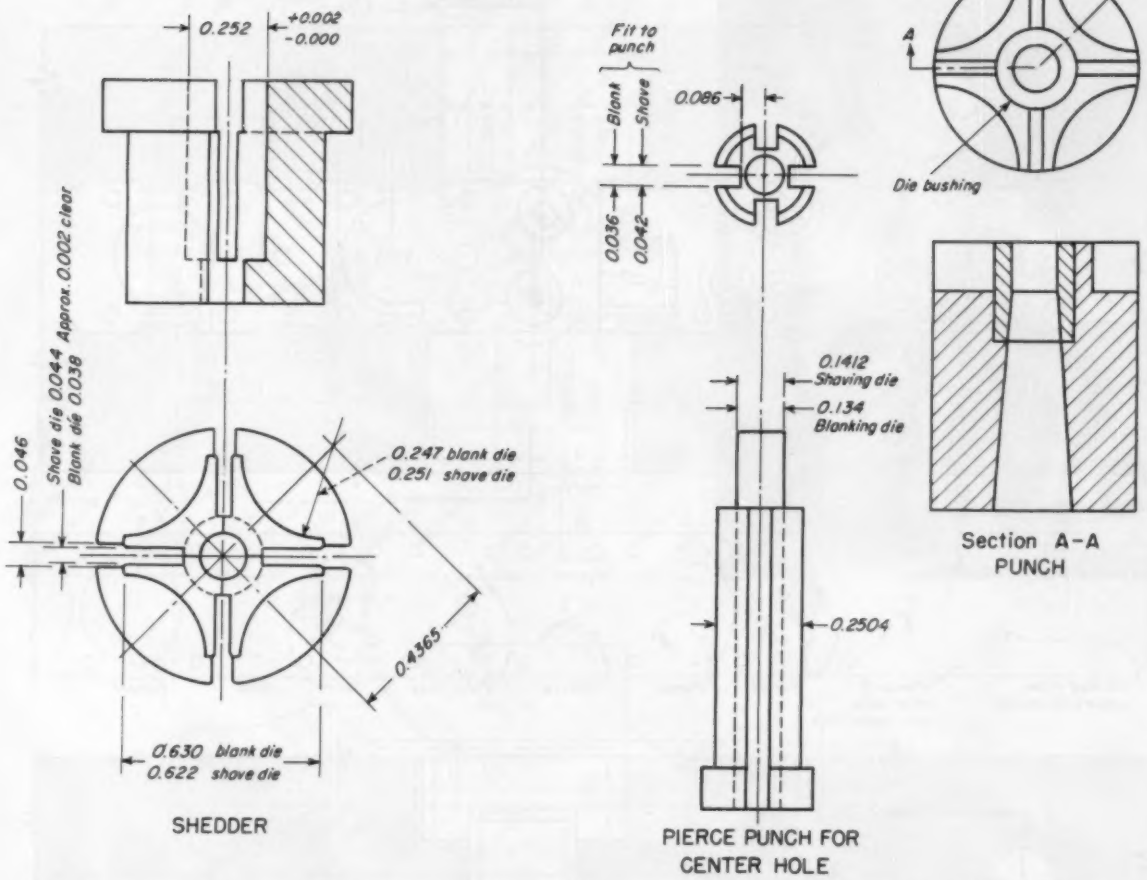


DIM.	BLANK	SHAVE
"A"	0.630	0.622
"C"	0.134	0.1412
"D"	0.036	0.042
"E"	0.246	0.250 R

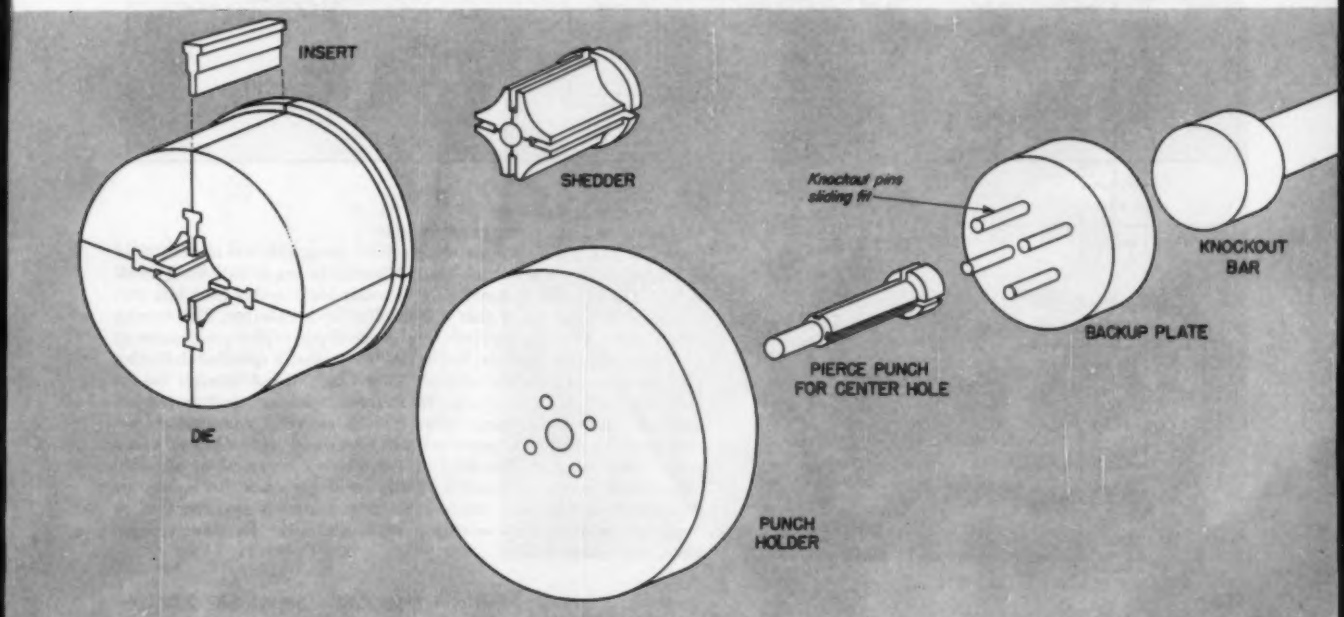
Die sections . . .
for a compound blanking and shaving die are made in four sections to permit grinding intricate profile on Studer grinder. Note amount of material left for blanking and shaving, and allowable clearance between lower and upper die members. Two independent die-set members are made, one for blanking and one for shaving; each set fits into its own chase in an independent die-set assembly. After the four die sections and inserts are assembled together, the end faces of the inserts are indicated concentric, and then the outside diameters of die are ground to size

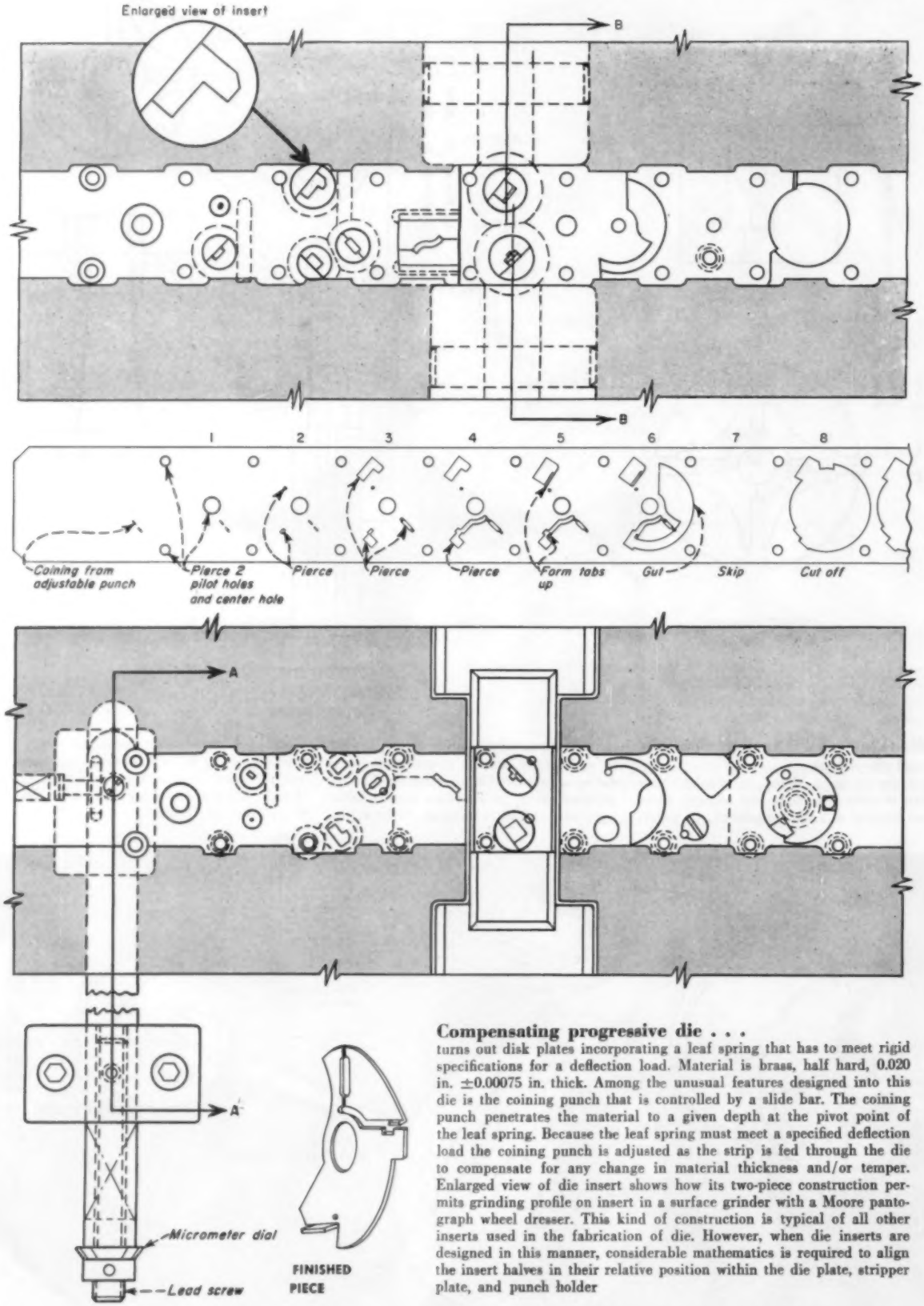
Assembly and operation . . .
of lower and upper die members follow in the sequence shown in exploded view. Note that thin sections of inserts are supported by slots in shedder and piercing punch





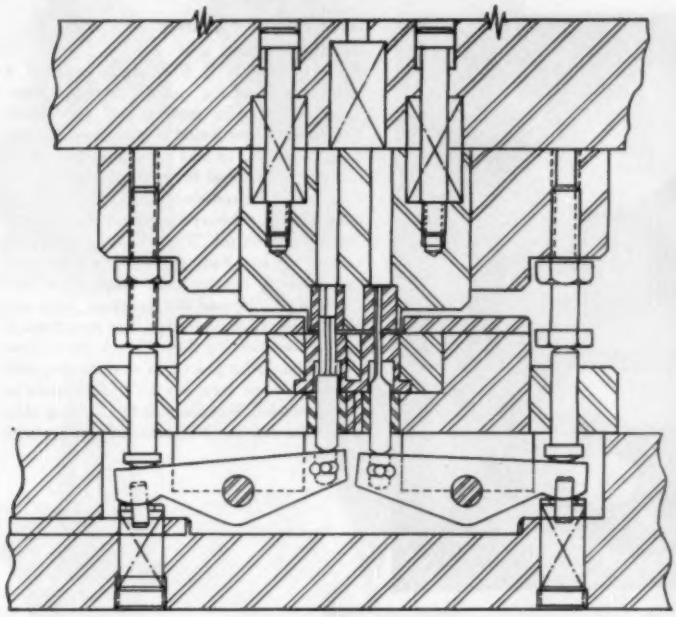
Blanking and shaving punches and shedders . . .
are ground on a Moore jig grinder. Note that shedder is made in four sections. Slots are finished in a surface grinder. All grinding operations must be accurately controlled to maintain 0.0002-in. clearance between die members. Excellent surface finishes are obtained when the following cutting lubricants are used in conjunction with shaving dies: magnesium and aluminum: equal parts of cutting oil and kerosene—stainless steel: Johnson Wax or Anchorlube—brass: straight cutting oil—other materials: 600 W cylinder oil (Socony)



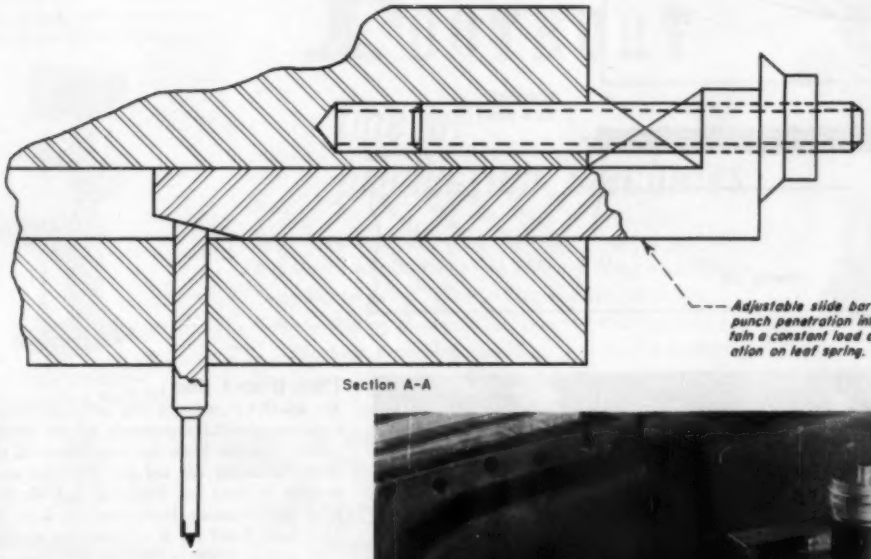


Compensating progressive die . . .
turns out disk plates incorporating a leaf spring that has to meet rigid specifications for a deflection load. Material is brass, half hard, 0.020 in. ±0.00075 in. thick. Among the unusual features designed into this die is the coining punch that is controlled by a slide bar. The coining punch penetrates the material to a given depth at the pivot point of the leaf spring. Because the leaf spring must meet a specified deflection load the coining punch is adjusted as the strip is fed through the die to compensate for any change in material thickness and/or temper. Enlarged view of die insert shows how its two-piece construction permits grinding profile on insert in a surface grinder with a Moore pantograph wheel dresser. This kind of construction is typical of all other inserts used in the fabrication of die. However, when die inserts are designed in this manner, considerable mathematics is required to align the insert halves in their relative position within the die plate, stripper plate, and punch holder

ADJUSTABLE COINING-PUNCH ...

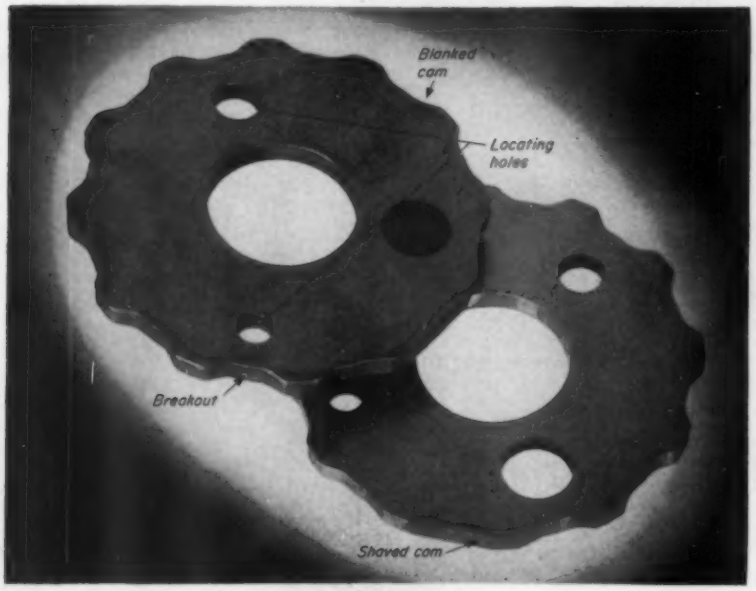


Section B-B

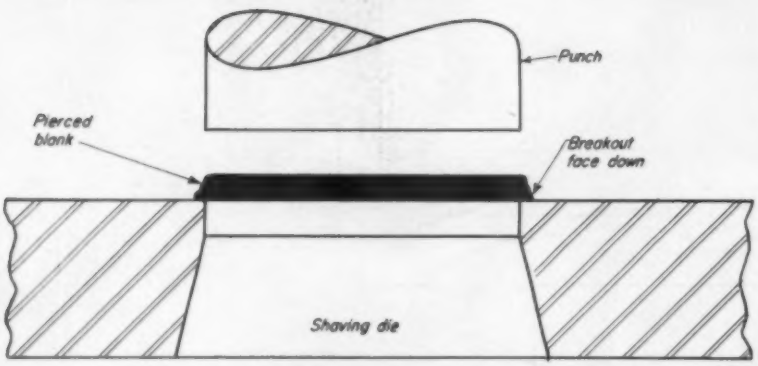

Adjustable slide bar governs amount of punch penetration into material to maintain a constant load deflection specification on leaf spring.

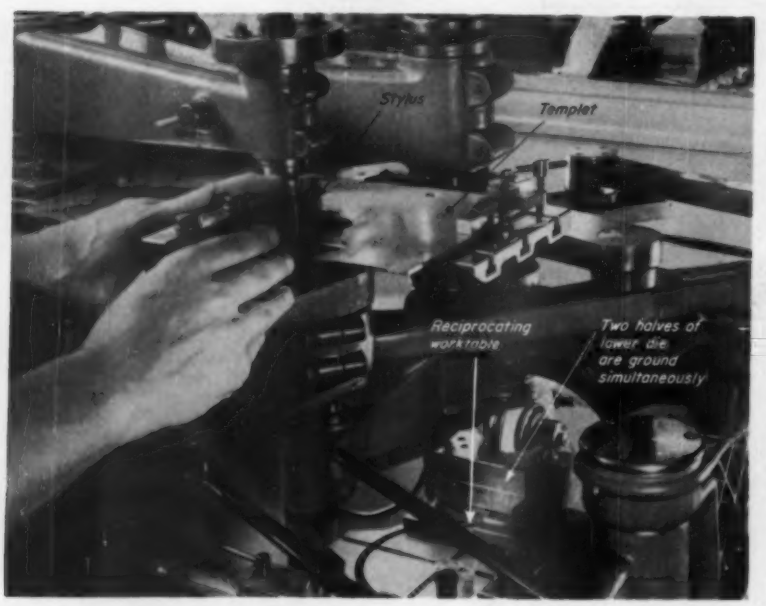
Section A-A

Checking fixture for load deflection test . . .
uses a light to indicate when the spring leaf falls within specified loads. Spring leaf must sustain an 80-gram load and not deflect beyond 0.062 in. When an additional load of 140 grams is applied the spring leaf must deflect slightly more than 0.062 in. If the degree of deflection exceeds these limits the light goes on. As the die is operating, every one hundredth piece is checked. When a part fails on the deflection test, its thickness and temper is checked and the compensating coining punch adjusted accordingly

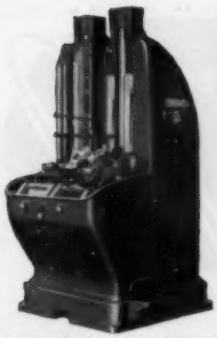


Blanked and shaved sewing-machine cam . . .
0.156-in.-thick SAE 1010 steel, required a compound blanking and a compound shaving die. Normally materials of this thickness and heavier would require two shaving dies; however, in this case only one shaving die is required because it is run in an Essa press. Excessive breakout resulting from blanking heavy-gage materials is very difficult to control. When it is necessary to remove the breakout, generally two methods are used. A heavier-gage material is run through the die and the breakout later machined away, or the parts are run through one or two shaving dies. Sketch shows how blank should be placed in shaving die with breakout edge face down. This position is recommended because now the shaving chip will thin out as the blank passes through the die



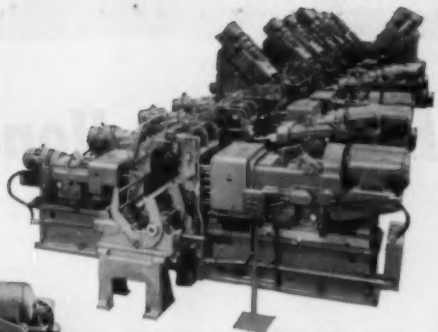


Punch and die . . .
for blanking and shaving sewing-machine cams are ground completely on the Studer profile grinder. Here the two halves of the lower blanking die are set up. The same templet is used for blanking and shaving dies by adjusting leadscrew on work table; here 0.010 in. is allowed for shaving cam profile, 0.008 in. for cam ID. (General rule: to determine amount of material allowed for shaving, add 0.002 in. to amount of breakout for each side). Daco finds this machine versatile for grinding difficult angles and intricate profiles because setup is fast, templet can be set at the same angle as the work (ie, flat form tools), templet-index table and work table rotate together so 360° profiles can be ground (as well as cylindrical contours)



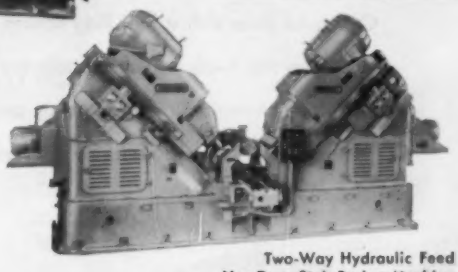
Duplex Surface Broaching Machine
5, 10, 15 and 25 Ton capacity

Three Way, 63 Spindle Central System Type, Hydraulic Feed, Horizontal Drilling and Boring Machine with Hydraulically Operated Fixture in Loading Position



Station Type Machine Having 27 Stations, 139 Spindles for Processing a V Type Automobile Motor Cylinder Block

Single Slide Broaching Machine
5, 10, 15 and 25 Ton capacity

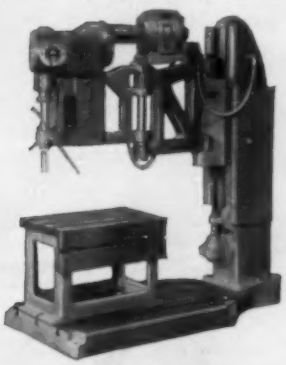


Two-Way Hydraulic Feed Vee Type Stub Boring Machine

FOOTBURT

line of production machines

1, 2, 3, 4 and 6 Spindle
Sensitive Drilling Machines



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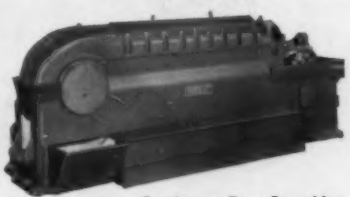
Extremely accurate Hammond Tool Room Grinder



Continuous Type Broaching Machine Built in Five Sizes

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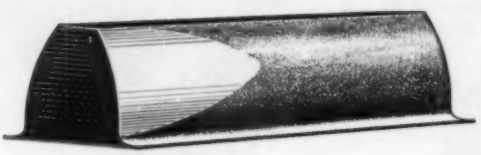
MACHINE TOOLS

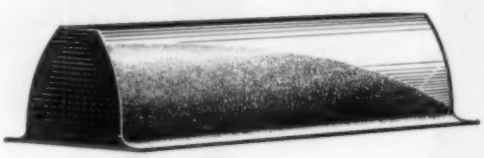
Hard Gear Honing

GIVES YOU BETTER GEARS AT LESS COST

QUICK GEAR INSPECTION

One quick pass with a Red Ring honing tool cleans up the teeth or immediately reveals heat-treat distortions, thus indicating corrective adjustments in the gear forming processes.





CORRECTION OF HEAT-TREAT DISTORTIONS

Minor distortions in tooth profile, helix, index and runout are corrected in from 15 to 60 seconds of honing time.

IN ADDITION

Gear honing provides:

- The Lowest Cost Remedy for Nicks and "Hickies"
- Improved Tooth Surface Smoothness
- Overall Sound Improvement

For Quality Gear Production, write for Bulletin H57-2 which gives the full story on Red Ring Hard Gear Honing.

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Roll angles for involute splines

CARL A JOHNSON

The tooth profiles of precision involute splines are often inspected on involute checking machines. For this operation the roll angles E at the limiting diameters must be established. For standard splines with working depth equal to one half that of standard gear teeth the limiting diameters are $\frac{N-1}{P}$ and $\frac{N+1}{P}$ where:

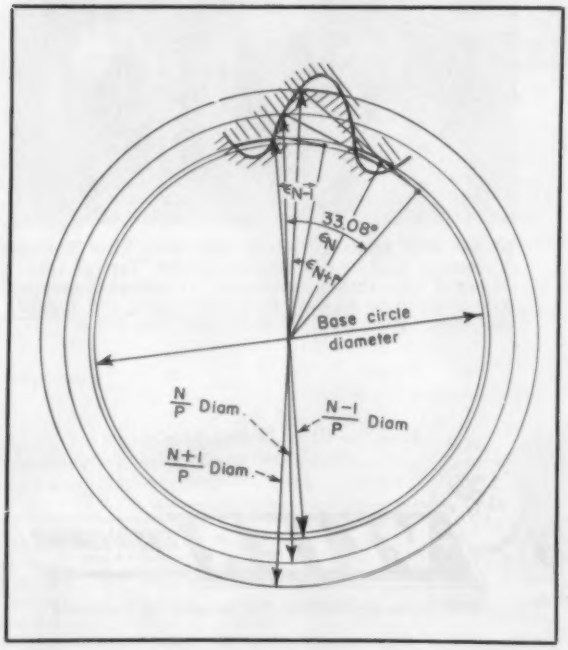
N = number of teeth in 30° P.A. spline

P = numerator of diametral pitch designation, which is the number of teeth per inch of pitch diameter

$\frac{N-1}{P}$ = True Involute Form (TIF) Diameter for external splines, all fits.
Minor diameter for internal splines, side fits, flat or fillet root.

$\frac{N+1}{P}$ = True Involute Form (TIF) Diameter for internal splines, side fits, fillet root or full dedendum flat root.
Major diameter for external splines, side fits, flat or fillet root.

For the convenience of inspectors the roll angles E_{N-1} and E_{N+1} at diameters $(N-1)$ and $(N+1)$ are listed in the accompanying table for splines of 9 to 56 teeth.

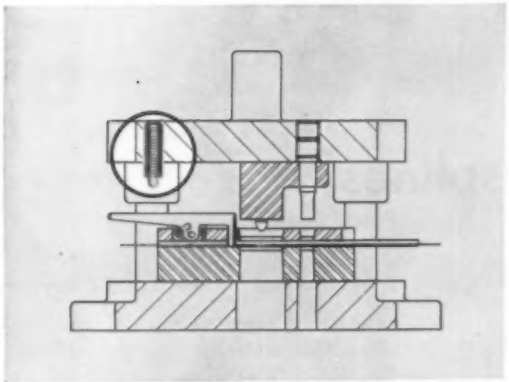


N	Roll Angle Deg. E_{N-1}	Roll Angle Deg. E_{N+1}	N	Roll Angle Deg. E_{N-1}	Roll Angle Deg. E_{N+1}
9	13.25	46.05	33	28.86	36.93
10	16.21	44.87	34	28.99	36.82
11	18.29	43.89	35	29.12	36.71
12	19.88	43.06	36	29.23	36.62
13	21.14	42.35	37	29.34	36.52
14	22.16	41.74	38	29.44	36.44
15	23.02	41.20	39	29.54	36.35
16	23.75	40.72	40	29.63	36.27
17	24.38	40.30	41	29.72	36.20
18	24.93	39.93	42	29.80	36.13
19	25.41	39.59	43	29.88	36.06
20	25.84	39.28	44	29.96	35.99
21	26.22	39.00	45	30.03	35.93
22	26.56	38.75	46	30.10	35.87
23	26.87	38.51	47	30.17	35.81
24	27.15	38.30	48	30.23	35.76
25	27.41	38.10	49	30.29	35.70
26	27.64	37.91	50	30.35	35.65
27	27.86	37.74	51	30.40	35.60
28	28.06	37.58	52	30.46	35.56
29	28.24	37.43	53	30.51	35.51
30	28.41	37.30	54	30.56	35.47
31	28.57	37.16	55	30.60	35.42
32	28.72	37.04	56	30.65	35.38

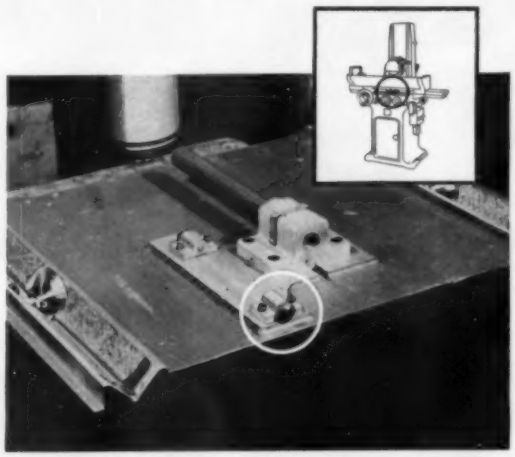
Practical Tooling Tips

Number 2 of a series.

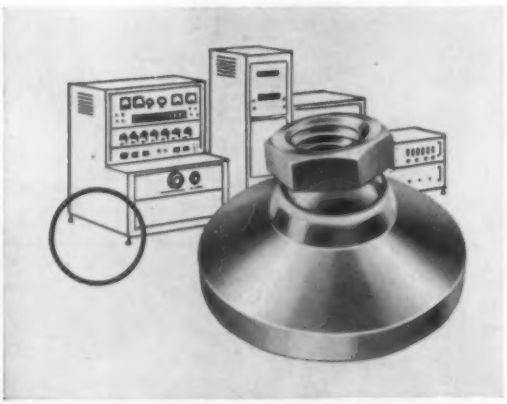
Substituting simple, off-the-shelf Vlier Tooling Accessories for complicated, custom-made devices in both tooling and original equipment applications can result in important savings. Why not put them to work in your plant?



TO STOP SMASHING DIE STOPS, substitute a Vlier Spring Plunger for the usual square-head screw. The plunger actuates the automatic stop perfectly and, unlike the screw, never needs adjusting no matter how many times the die is resharpened. Available in four models: 50 sizes.



TO CUSHION SHOCK as the bed traverses, this surface grinder manufacturer uses two Vlier Spring Stops, reducing wear and tear on the machine. These clever, spring-loaded devices, ordinarily used on fixtures where the absence of side walls prevents the use of spring plungers, are now available in three standard sizes: 3 end pressures. Special sizes made to quantity orders.



TO LEVEL MACHINE TOOLS, electronic racks, benches, etc., use the *standard* Vlier leveling pad. The pad swivels to 7½° each side of the center line; adjusts automatically to uneven surfaces. Unique ball-joint design distributes weight over entire pad surface.

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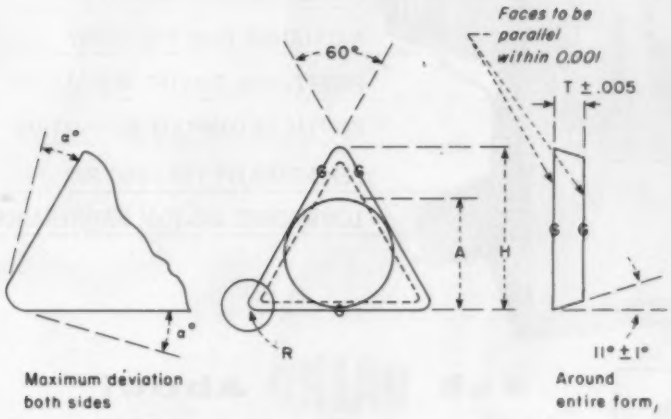
Positive-Rake Carbide Blanks



Triangular Inserts

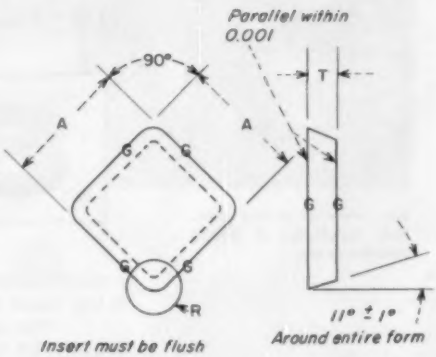
Designation	A	T	H	R	α° Max from Tangency
Utility Grade					
TBP-8U2	0.250	0.125	0.344 ± 0.007	1/32	20°
TBP-12U3	0.375	0.125	0.516 ± 0.007	3/64	15°
TBP-16U4	0.500	0.188	0.688 ± 0.007	1/16	15°
TBP-20U6	0.625	0.250	0.844 ± 0.008	3/32	15°
TBP-24U8	0.750	0.313	1.000 ± 0.010	⅛	10°
TBP-28U10	0.875	0.375	1.156 ± 0.012	5/32	10°
TBP-32U10	1.000	0.375	1.344 ± 0.014	5/32	10°
Precision Grade					
TBP-8P2	0.250	0.125	0.344	1/32	20°
TBP-12P2	0.375	0.125	0.531	1/32	20°
TBP-12P4	0.375	0.125	0.500	1/16	15°
TBP-16P4	0.500	0.188	0.688	1/16	15°
TBP-16P8	0.500	0.188	0.625	⅛	10°
TBP-20P6	0.625	0.250	0.844	3/32	15°

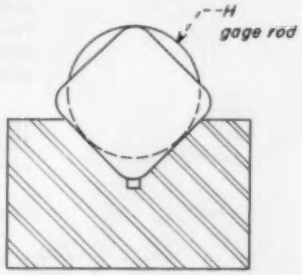
Square Inserts

Designation	A	T	H	R	X	α° Max from Tangency
Utility Grade						
SQP-12U2	0.375 ± 0.005	0.125	0.429	1/32	0.005	15°
SQP-16U3	0.500 ± 0.005	0.125	0.570	3/64	0.007	10°
SQP-24U4	0.750 ± 0.007	0.188	0.857	1/16	0.010	10°
Precision Grade						
SQP-12P2	0.375	0.125	0.429	1/32	0.001	15°
SQP-16P2	0.500	0.125	0.575	1/32	0.001	15°
SQP-16P4	0.500	0.125	0.564	1/16	0.001	10°
SQP-24P4	0.750	0.188	0.857	1/16	0.001	10°
SQP-24P8	0.750	0.188	0.836	⅛	0.001	5°

Tolerances on Triangular Inserts

Dimension	Utility	Precision
60° Angle	± 0°15′	± 0°5′
A	± 0.005	± 0.001
H	See other table	± 0.001 all sizes

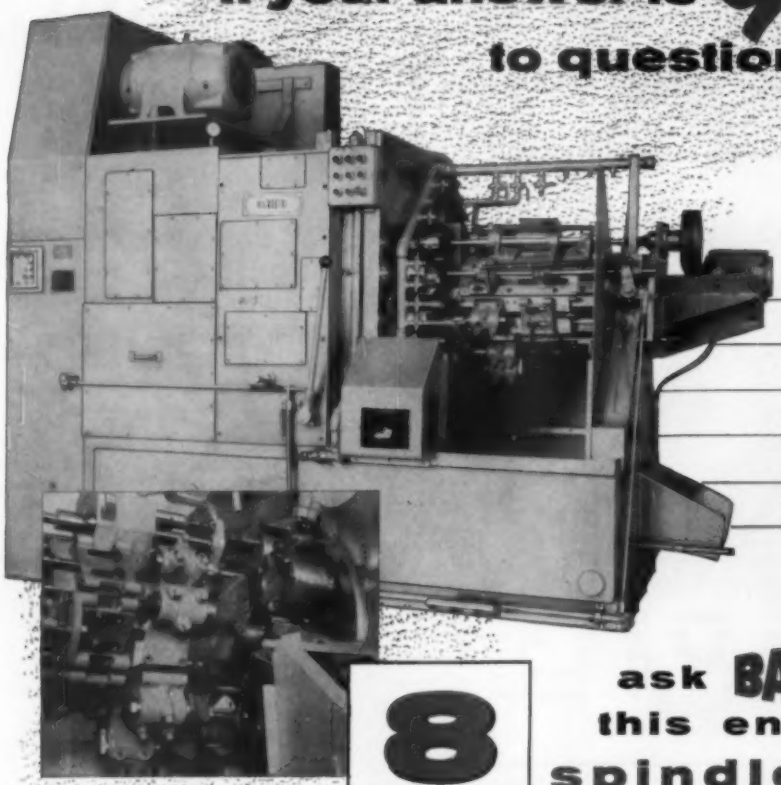




Tolerances on Square Inserts

Dimension	Utility	Precision
90° Angle		± 5′
A	See other table	± 0.001
T	± 0.005	± 0.005

If your answer is *yes* to questions like these:



Does your work call for . . .

HIGHEST PRODUCTION RATES?

MAINTAINED HIGH PRECISION?

EXCEPTIONAL TOOLING VERSATILITY?

PARTIAL OR COMPLETE AUTOMATION?

DEPENDABILITY FOR LONG RUNS?

LOW MACHINE AND TOOL MAINTENANCE?

Rear view of tooling area. Note installation of drilling spindles at top.

8 ask BAIRD about this entirely NEW spindle chucker

As every machine tool man knows, BAIRD Chuckers are the mainstay of the automotive piston production lines . . . and have for many years maintained this position of leadership in high speed, high precision and EXTREMELY DEPENDABLE production.

Now, out of this background of experience, Baird engineers are proud to present the NEW MODEL 78H 8-SPINDLE HIGH SPEED AUTOMATIC CHUCKING MACHINE.

This machine continues the well-proved basic features of previous Baird chuckers PLUS very much expanded capacity for operations and tooling. In addition to such advantages as controlled feeds and speeds for each spindle and independent strokes and feeds for each cross slide, the new universal two-stroke cross slides, with 3" max. stroke, are interchangeable among three positions covering six spindles. Individual longitudinal slides are arranged for one or two cutting strokes, and also for separate operation when used in tapping or drilling.

Heavy duty main drive includes provision for use of 50 h.p. motor and timing belt drive components. There is also provision for convenient power take-off as required for tooling attachments. All critical bearings are pressure lubricated with meter-controlled pressure lubrication to cross slides as well as tool slides. Power cranking is standard.

Model 78H is designed for installation of latest developments in special tooling and fully automatic control, with single or double indexing, automatic chucking, auto load and unload.

Clean and open design in work and tooling areas makes even complex set-ups less costly to install and much easier to maintain.

For manufacturers who can use its tremendous production potential, this important new machine represents an outstanding step forward in unit cost reduction. You are cordially invited to send us an outline of your production requirements for study and recommendations. Write Dept. AM.

BAIRD about it

THE BAIRD MACHINE COMPANY • STRATFORD, CONN.

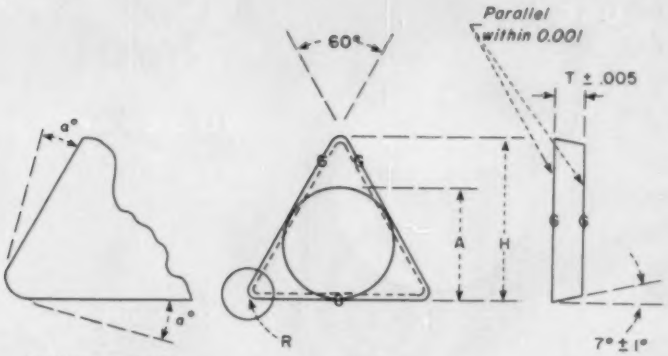
Ask Baird about these other major aids to high production at low cost.

High Speed Automatic Multiple Transfer Presses • Automatic 12-Station Duplex Turning Machines • Vertical Continuous Lathes • Automatic Four-Slide Machines • Press-Formatic Flat Metal Forming Machines • Barrel Finishing Machinery • Specialized Machinery for Chain and Roller Chain Production, Garment Hook and Eye Production • Precision Bench Presses

IBA57

Throw-Away Carbide Inserts . . III

NEUTRAL-RAKE CARBIDE BLANKS



Triangular Inserts

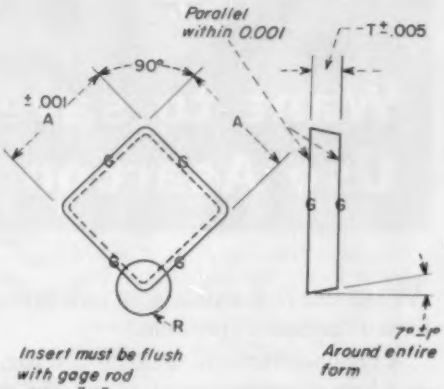
Designation	A	T	H	R	a° Max from Tangency
		Utility Grade			
TBN-8U2	0.250	0.125	0.344 ± 0.007	1/32	20°
TBN-12U3	0.375	0.125	0.516 ± 0.007	3/64	15°
TBN-16U4	0.500	0.188	0.688 ± 0.007	1/16	15°
TBN-20U6	0.625	0.250	0.844 ± 0.008	3/32	15°
TBN-24U8	0.750	0.313	1.000 ± 0.010	⅛	10°
TBN-28U10	0.875	0.375	1.156 ± 0.012	5/32	10°
TBN-32U10	1.000	0.375	1.344 ± 0.014	5/32	10°
		Precision Grade			
TBN-8P2	0.250	0.125	0.344	1/32	20°
TBN-12P2	0.375	0.125	0.531	1/32	20°
TBN-12P4	0.375	0.125	0.500	1/16	15°
TBN-16P4	0.500	0.188	0.688	1/16	15°
TBN-16P8	0.500	0.188	0.625	⅛	10°
TBN-20P6	0.625	0.250	0.844	3/32	15°

Square Inserts

Designation	A	T	H	R	X	a° Max from Tangency
			Utility Grade			
SQN-12U2	0.375 ± 0.005	0.125	0.429	1/32	0.005	15°
SQN-16U3	0.500 ± 0.005	0.125	0.570	3/64	0.007	10°
SQN-24U4	0.750 ± 0.007	0.188	0.857	1/16	0.010	10°
			Precision Grade			
SQN-12P2	0.375	0.125	0.429	1/32	0.001	15°
SQN-16P2	0.500	0.125	0.575	1/32	0.001	15°
SQN-16P4	0.500	0.125	0.564	1/16	0.001	10°
SQN-24P4	0.750	0.188	0.857	1/16	0.001	10°
SQN-24P8	0.750	0.188	0.836	⅛	0.001	5°

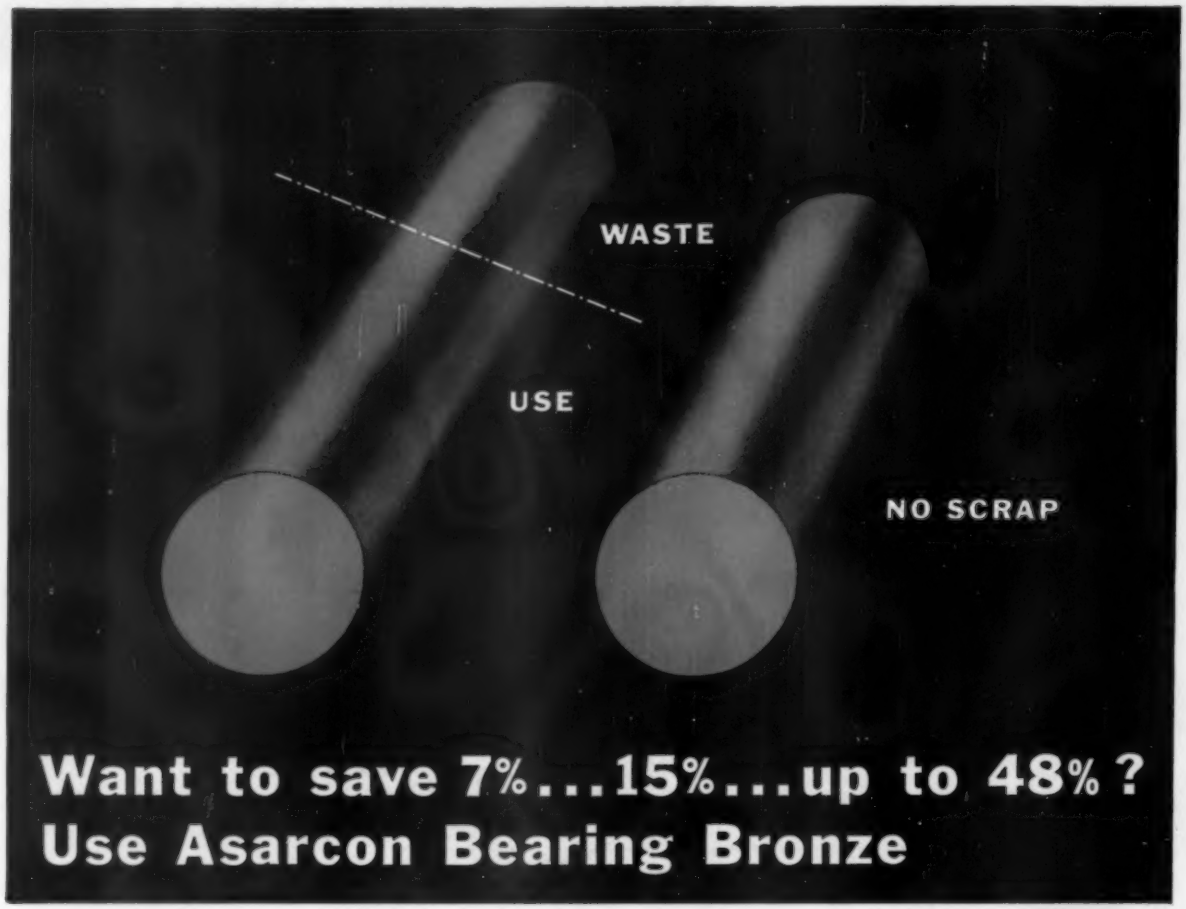
Tolerances for Triangular Inserts

Dimension	Utility	Precision
60° Angle	± 15′	±5′
A	± 0.005	± 0.001
H	——	± 0.001



Tolerances for Square Inserts

Dimension	Utility	Precision
90° Angle	± 15	± 5
A	——	± 0.001



Want to save 7%...15%...up to 48%? Use Asarcon Bearing Bronze

When you buy standard 13-inch bronze bars, you have a "remnant" problem.

A one-inch remnant on a 13-inch bar, is a 7.6 per cent loss; a two-inch remnant is a 15.3 per cent loss; and, if you bought a 13-inch bar when you needed only 6¾-inches, your loss could run as high as 48 per cent.

When you buy Asarcon 773 Continous-Cast bearing bronze, however, you can get the *exact* lengths you need, all the way up to 105-inches. You save on short-end scrap; moreover, you'll find that you're saving on diameter losses and machining time as well. For, with Asarcon 773 you order the *diameters* you want, up to 9-inches. The clean-up allowance for the size you specify is in the piece you get, and is less than the common ¼ inch on rough-cut bars; and Continous-Cast cored bars save you costly machining time plus the weight of the core metal.

Asarcon 773 (SAE 660) is stocked—in 260 sizes, solids and tubes – by a national network of conveniently located distributors. Talk to one of them, or write directly to us. We'll be glad to show you how other companies are turning short-end scrap losses into savings.

ASARCO

Continuous-Cast Products Department

AMERICAN SMELTING AND REFINING COMPANY

Perth Amboy Plant, Barber, New Jersey • Whiting, Indiana

WEST COAST SALES AGENT: Kingwell Bros. Ltd., 457 Minna Street, San Francisco IN CANADA: Federated Metals Canada, Ltd., Toronto and Montreal

Talking Shop...

Das Missile Spielen

SOME AMIABLE GENIUS in the Air Force's Research & Development command has compiled a glossary inspired by the number of German scientists working on missile development. His handiwork has spread across the country faster than the leak that a Jupiter vehicle has successfully flown 3600 miles, but on the off chance that you may not have seen it yet, we think the glossary is worth repeating:

Guided missile—Das Sientifiker Geschtenwerkes Firenkrakker.

Rocket engine—Firesphitter mit Smoken-und-Schnorten.

Liquid rocket—Das Skwirten Jucenkind Firenschpitter.

Guidance system—Das Schteerenwerke.

Celestial guidance—Das Schruballische schtargazen Peepenglasser mit Komputerattachen Schteerenwerke.

Pre-set guidance—Das Senden offen mit ein Patternbacker und Finger Gekressen Schteerenwerke.

Control system—Das Pullenund-Schoven Werke.

Warhead—Das Laudenboomer.

Nuclear warhead—Das Eargeschplitten Laudenboomer.

Hydrogen device—Das Eargeschplitten Laundenboomer mit ein grosse Holengraund und alles kaput.

Blind Leader

THAT REMARKABLE blind man, Ralph Teetor, who recently retired as president of Perfect Circle, has devised a control to limit the speed of autos without the hazards of the governor. Not only did he design the instrument, but he built the first one in his home workshop. Speed is set on a dial by the driver and the accelerator resists pressure that would carry the car above this speed, but in a pinch the driver can go faster merely by pushing a little harder on the gas pedal. This at least makes the driver conscious that he is speeding. Teetor says that he used to be able to tell a car's speed within two miles an hour by "feel," but he can no longer do this because the speed is so deceptive in the smooth-riding new models.

Electron Probe

CALTECH HAS DEVELOPED a device for Army Ordnance that can make a chemical analysis of a tiny spot on a metal surface. A beam of electrons is directed on the surface and the wavelength and intensity of the X-rays produced indicate the composition. The developers seemed to have some atomic engineering problems in mind, but the new instrument has potential applications that are far broader. Can you imagine what would happen if a receiving inspector got his hands on an electron probe?

Epoxy Tips

MOST OF THE TROUBLES with plastic fixtures come from the exothermic heat reaction of epoxy resins, according to Edward R Kalis, general foreman at Fisher Body. Shrinkage is caused by over-saturating the glass fibers so that the laminate will overheat and shrink when it is cooled. Warpage is usually traceable to excessive resin draining into pockets and causing hot spots. These points were made by Mr Kalis at the recent SAE Production Meeting in Buffalo. He feels that the proper way to saturate the glass fibers is on a table that has been waxed with paste wax or covered with waxed paper. Resin is poured on the cloth and spread over the surface with a thin, flat piece of wood. Then the excess is scraped over to one side of the table. Now there's an idea for diversification in the bakery business. Pastry cooks may be competing with toolmakers.

Giant Camera

A TEMPLET CAMERA just installed at Convair-San Diego weighs more than 5 tons, is 30 feet long, 8¾ feet high and 7 feet wide. Somebody at Convair with a passion for comparison has calculated that the camera is both heavier and larger than an elephant. With the camera, templets up to 5 x 12 ft are reproduced directly on sensitized steel, aluminum, or glass cloth. Use of templet cameras is common in the aircraft industry but they aren't usually so large. This one was built, at a cost of $50,000 by Robertson Photo-Mechanix of Chicago, and will be used for the Convair jetliner.

Machining Demonstration Draws 1000

CLEVELAND — An unprecedented machining demonstration by a metal producer and a machine tool builder attracted the attention of over 1000 metalworking executives and production men here September 10 and 11. Mutual interest in the machining of aluminum was the basis for a joint demonstration by the National Acme Co and the Aluminum Company of America.

National Acme set aside a large area of its plant for a line of automatic screw machines to run various parts made of brass, steel and other materials in addition to aluminum alloys. Observers were thus able to analyze the economic advantages of aluminum as a free machining screw stock. In addition to demonstrations of the production of typical aluminum parts on National Acme machines, screw machining operations were performed on other metals to compare feeds, speeds, and costs.

Film and Clinic

Alcoa showed its new motion picture, "The Four Amazing Alloys" and a clinic was held on proper tooling for machining the four aluminum alloys that are most widely used in industry. A tour of the National Acme plant offered an opportunity to see automatic bar and chucking machines being built.

The line of screw machines in operation included a number of British-built BSA single-spindle automatics in sizes ranging from ½- to 2-in. These machines fill out National Acme's normal line with important single-spindle machines for high speed mass-production. The firm has been the largest U S agent for BSA automatics for the past two years.

Bar Automatic Featured

Of special interest was the new Acme-Gridley 7/16-in. RA-6 spindle bar automatic—a machine specifically developed for the production of small parts. Main features of this automatic bar machine—which is actually a scaled-down version of the Acme-Gridley—are highly accurate indexing and spindle stopping.

In a demonstration of cost comparisons between aluminum and brass, oil can spout tips were made from 5/16-in. dia round stock in the RA-6. Free-cutting SAE 72 brass parts cost $4.32 per thousand. Material cost for 19 lb of brass at $0.35 per lb was $6.73 for this many parts. Scrap costs—to be deducted—were $2.38, allowing 14 lb at $0.17 per lb.

Aluminum Costs Less

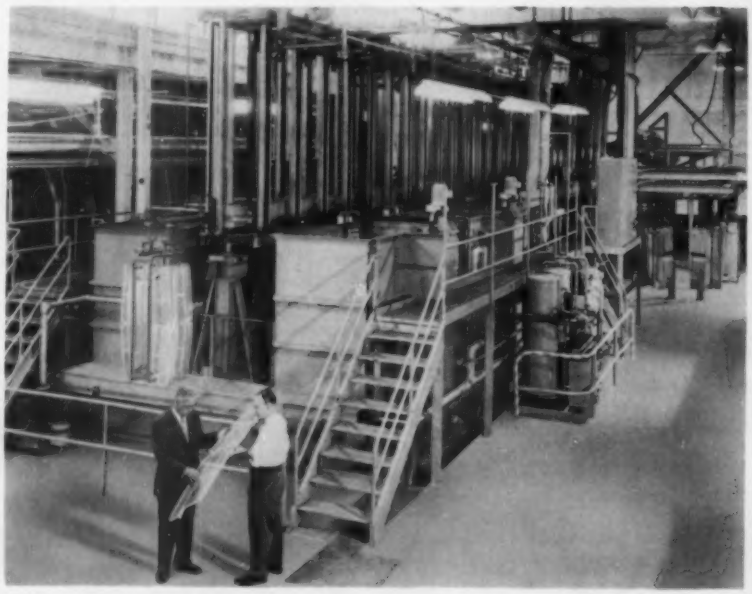
By contrast, aluminum parts cost $3.30 per thousand—a saving of 24.2%. Here free-cutting 2011-T3 aluminum was used, and for 1000 parts, 6.3 lb at $0.66 per lb cost $4.15. Scrap cost was only $0.85 for 4.7 lb at $0.18 per lb.

All Operations in 1 Setup

A 9/16-in. machine was used to show the completion of all operations in one setup on an aluminum switch part that previously required several setups because of cross-drilling and tapping as well as milling operations. Total time saved in the new setup was 15½ seconds per part by completely finishing it in 5 seconds, compared with the 21 seconds formerly needed. Principal aim in these operations is to produce a finished part wherever possible. For this reason, two cross-slides are provided at the bottom of the tooling area, along with two at the top and two side slides for cutting at right angles to the work axis—as well as end-cutting operations. As many as 22 different operations have been performed in one setup with these machines.

Machining Problems Answered

Visitors were encouraged to gather information relative to their own specific screw and bar machining problems as well as general data on the machining of aluminum, brass and other material. Current widespread interest in aluminum and its increasing use in metalworking stimulated considerable interest in these demonstrations.



Giant Anodizer for Firestone

This huge heavy-duty aluminum anodizer, which can permanently die aluminum any color, is now at work at Firestone Steel Products Co, Akron, Ohio, turning out automobile grilles and body trim for the '58 models. The anodizing section takes up 10,000 sq ft of floor space, can treat 5000 sq ft of aluminum per hour, putting it through 21 different sequence solutions. The machine can produce six different finishes simultaneously

Capital Spending Pace Slows

WASHINGTON—U S industry, for the first time in two years, is planning to reduce the pace of spending for new plant and equipment.

The downturn, if it comes as the figures in the accompanying table shows, will be in the fourth quarter of this year—a slight reduction in plant and equipment outlay, as compared with the third quarter on a seasonally-adjusted basis.

These figures are a compilation —by the Securities & Exchange Commission and the Commerce Dept —of business intentions as reported to the government in late July and August.

Despite the anticipated overall dip, actual expenditures for 1957 as a whole are being sustained at a record high level. For the year, they should total $37.03 billion, a 6% gain over the $35.08 billion of 1956. But economists see a flattening out process in the making, because the 1956 total was a whopping 22% above the $28.7 billion-level of 1955.

(Continued on next page)

All Business' Capital Spending 1955-1957

(Millions of dollars) (Not seasonally adjusted)

				Quarterly breakdown						
				1956				1957		
	1955	1956	1957	1Q	2Q	3Q	4Q	1Q	2Q	3Q*	4Q*
Manufacturing	11,439	14,954	16,191	2,958	3,734	3,834	4,428	3,505	4,183	4,414	4,089
Durable goods industries	5,436	7,623	8,218	1,462	1,862	1,960	2,339	1,759	2,120	2,243	2,096
Primary iron and steel	863	1,268	1,684	219	306	296	447	327	437	452	468
Primary nonferrous metals	214	412	875	69	88	103	152	147	217	252	259
Electrical machinery and equipment	436	603	653	104	142	158	199	126	152	184	191
Machinery except electrical	809	1,078	1,257	227	254	267	330	270	317	338	332
Motor vehicles & equipment	1,128	1,689	1,194	341	431	464	453	297	314	336	247
Transportation equipment, excluding motor vehicles	274	440	596	77	103	120	140	126	150	168	152
Stone, clay and glass products	498	686	604	132	172	181	201	135	156	155	158
Other durable goods	1,214	1,447	1,355	293	366	371	417	331	377	358	289
Nondurable goods industries	6,003	7,331	7,973	1,496	1,872	1,874	2,089	1,746	2,063	2,171	1,993
Food and beverages	718	799	828	178	208	203	210	201	225	208	194
Textile mill products	366	465	397	108	126	110	121	111	114	92	80
Paper and allied products	518	801	847	155	203	206	237	192	216	240	199
Chemicals and allied products	1,016	1,455	1,795	283	364	370	438	353	435	513	494
Petroleum and coal products	2,798	3,135	3,418	627	803	813	892	728	892	929	869
Rubber products	150	201	208	40	50	50	61	46	53	54	55
Other nondurable goods	437	475	480	105	130	115	128	135	102	118	122
Mining	957	1,241	1,242	262	319	314	346	300	327	325	290
Railroad	923	1,231	1,457	297	325	277	332	342	362	409	344
Transportation other than rail	1,602	1,712	1,751	396	423	443	450	358	478	461	454
Public utilities	4,309	4,895	6,254	936	1,199	1,308	1,452	1,205	1,510	1,823	1,716
Communication	1,983	2,684		570	673	663	778				
Commercial and others	7,488	8,364	10,135	2,043	2,207	2,062	2,052	2,572	2,730	2,525	2,308
TOTAL	28,701	35,081	37,030	7,462	8,880	8,901	9,838	8,282	9,590	9,957	9,201

* Estimated

More evidence of the flattening out process is seen in the table of figures showing various business sectors' expansion plans on a quarterly basis, with adjustment to take care of seasonal influences.

For example, fourth quarter spending for expansion in the durable goods industries—including primary metals, machinery, motor vehicles and such—will be at an $8.16 billion rate. (That only means that the fourth quarter rate, if sustained for the entire calendar year, would amount to that sum.) A look at the figures shows the $8.16-billion rate is a declining one. The estimated annual rate in this, the third quarter, is $16 million higher, or $8.32 billion.

Some sectors of business, however, show signs of resisting the flattening out trend. For instance, actual expenditures of $468 million for expansion in primary iron and steel is anticipated in the fourth quarter, whereas that sector is estimated to be spending only $452 million on new plant this quarter.

You can see the same resistance to the overall trend in primary nonferrous metals and electrical machinery.

On the other side of the picture, however, are such segments as machinery (excluding electrical), where spending plans indicate a drop to $332 million in the fourth quarter from $338 in this period; motor vehicles, where a sharp turndown of $89 million is indicated for the fourth period; and transportation equipment (excluding vehicles).

Government economists actually do not take these signs too seriously, because fourth period intentions are, by tradition, understated. It is to offset this tendency toward understatement that SEC and Commerce also publish the related tabulation on spending at an annual rate.

This ends a solid two-year succession of quarterly increases. In 1956, the seasonally adjusted quarterly increases for all industry ran this way (annual rates): 1st quarter, $1.4 billion; 2nd quarter, $1.7 billion; 3rd quarter, $1.4 billion; 4th quarter, $600 million. In 1957, with third and fourth periods estimated, this is the picture: 1st quarter, $430 million; 2nd quarter, $140 million; 3rd quarter, $260 million; 4th quarter, minus $6 million.

The indicated fourth quarter drop is, of course, almost infinitesmal in a booming economy, and anything can happen to the anticipated trend before actual final figures are in. But economists accept these preliminary findings as a sign that the flattening out of plant and equipment expenditures is at least continuing.

Postwar Profits Excessive? "No!" MAPI Finds

WASHINGTON—The theory, widely held on the part of the American public, that corporate profits in the decade since World War II have been excessive is an "economic myth," according to the Machinery & Allied Products Institute. The Institute, which has just completed an exhaustive analysis of corporate profits for the decade 1947-1956, comparing them with those of 1923-1929, made seven basic findings:

- Postwar corporate profits, as reported by the corporations themselves, have been grossly overstated during the postwar years—as much as 30% more than reality. Responsible for this state of affairs is the prevailing accounting practice of charging historical costs of inventory and fixed assets consumed in production, rather than the equivalent of such cost in current dollars. In other words, as the dollar shrinks, the charging of earlier costs isn't enough to restore the real capital used up in production. MAPI's suggests that postwar accounting profits be charged in current dollar values, not historical ones.
- Because of such accounting inaccuracies, effective corporate income tax rates have exceeded stated rates by an average of nearly 7%.
- After appropriate adjustments, postwar profits have represented a far lower ratio to sales, income produced, or compensation of employees, than did the adjusted profits of the Twenties. The reduction of these ratios amounts to something like 40%.
- Again after appropriate adjustments, postwar profits have represented about the same margin on corrected net worth that held true in the 1923-1929 period.
- Income produced per dollar of corrected net worth has been about 75% higher in the postwar decade than it was in the Twenties. If long-term debt is added, the ratio of increase has been more than 80%.
- Postwar corporate net saving, after correction, has been only 55% of the reported saving. The ratio of corrected saving to income produced has been lower by more than 25% than in the pre-depression period of 1923-1929.
- Postwar divident payments, while low in relation to income produced, have averaged almost as large a proportion of corrected profits as in the 1923-1929 period. In the most recent years of the 1947-1956 decade they have been fully as large.

In a blistering condemnation of the "who cares?" attitude of some corporate officials, MAPI says that those officials who take such illusory figures at face value are fooling "not only labor, political leaders and the public generally, but themselves as well.

"They are victims of their own myth. It is impossible to believe that this self-deception has been harmless. For management can arrive at sound decisions only when correctly informed of the facts. . . . Surely it behooves management to reconsider the accounting practices that have created the distortion, and if possible, to try to avoid similar errors in the future.

"If," MAPI President Charles W Stewart concludes, "the American corporate system had shown its true profits of $144 billion for the decade (1947-1956) rather than the $187 billion it did show, it would have saved itself much misdirected criticism and attack."

The results of MAPI's findings on the shortcomings of corporate profits accounting, and the Institute's recommendations as to what can be done to remedy the situation, have just been published in a 27-page pamphlet written by MAPI's research director, George Terborgh. It contains seven charts dealing with depreciation, amortization, inventory, employee compensation, corporate sales, net worth, and intercorporate dividends.

Copies of "Corporate Profits in the Decade 1947-1956" may be obtained from Machinery & Allied Products Institute, 1200 Eighteenth St NW, Washington 6, D C. Price to MAPI member companies is $1 per copy, to others $1.25.

East...

Armco Comes Up With New High-Temp Stainless

NEW YORK—A new high-strength, high-temperature stainless steel that will cost just about one-tenth as much as titanium was unveiled here September 10 by Armco Steel Corp. The stainless, designated Armco PH 15-7 Mo, is claimed to "provide the best combination of characteristics for aircraft and missiles flying up to 2700 mph of any metal available today." The low-cost material will be used primarily for skins and major structural parts.

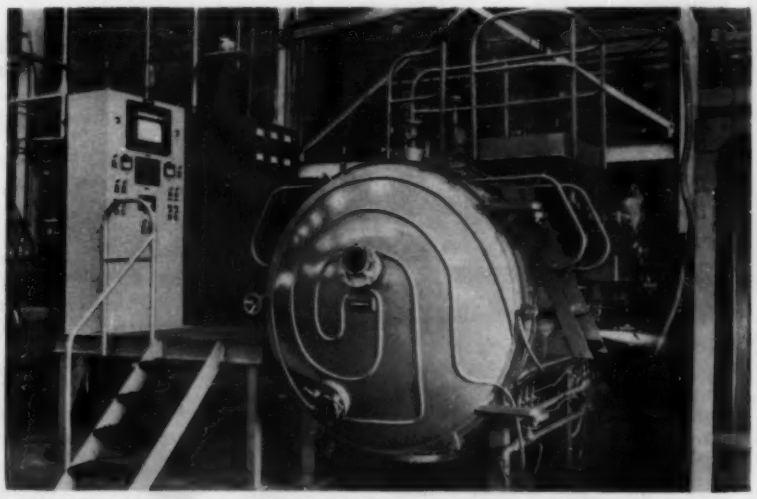
Planes using PH 15-7 Mo will be able to fly in an air friction heat of 1000 F at speeds of Mach 4. That's 2720 mph—or four times the speed of sound.

To insure production in volume of the new metal, Armco will spend some $70 million for improvement and expansion of its Butler, Pa, plant. Reason: Armco's market analysts are convinced that within the next five years the aircraft and missile industry can become the top user of stainless steel, buying as much as $200 million worth a year.

PH 15-7 Mo (PH stands for precipitation hardening, incidentally) is made from 15% chromium, 7% nickel and a small percentage of molybdenum. Made in conventional electric furnaces and rolled on continuous strip mills, it is now available commercially.

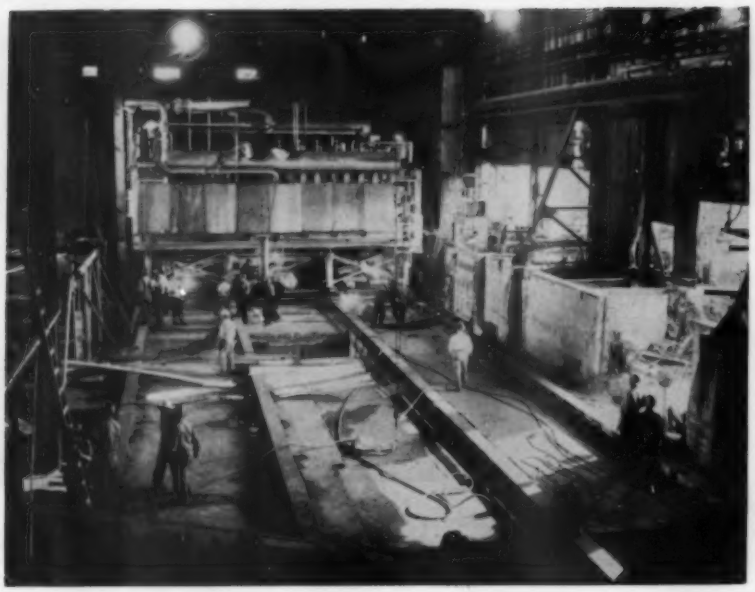
Around the East . . .
P R Mallory & Co, Sharon Steel Corp, and **National Distillers & Chemical Corp** are consolidating their titanium, zirconium, and other light metals operations into a single company that'll have assets of $55 million. **Mallory-Sharon Titanium Corp,** now owned jointly by the two companies, will acquire all of **National Distillers'** titanium and zirconium production facilities and change its name to **Mallory-Sharon Metals Corp,** with each of the three firms holding one-third interest . . . **Daystrom, Inc,** Elizabeth, NJ, has set up a "Controlonics Group" to design, engineer, integrate, and produce complete systems in the instrumentation and control fields. Daystrom units involved are the **Weston Electrical Instrument Corp,** Newark, NJ; **Daystrom Systems Division,** La Jolla,

Poor-Housekeeping Award . . .
A large eight-ball goes to the sloppiest department at Associated Spring Corp's Seaboard Pacific Division, Gardena, Calif, where it hangs in full view for a month. Each week a committee of non-supervisory employees inspects every department in the plant—always at unscheduled times—to rate each department on neatness and cleanliness. At month's end, the one with the most demerits must display the eight ball for the coming month. Says Plant Manager Charles W Anderson, "It may be corny, but it works. No department has ever won the eight ball twice in a row, and there has been a marked improvement in the tidiness of our plant since we started this award." Here Vernon Bell, left, foreman of the special forming department, accepts the uncoveted award from Assistant Plant Manager Howard Unkrey



Experimental Vacuum Melting Furnace . . .
This 500-lb-capacity vacuum melting furnace, built by F J Stokes Corp, will be used for industrial engineering investigations of titanium and other reactive metals for new applications at Watertown Arsenal. The furnace, which produces high-purity metals free of slag and gas inclusions, pours the metal into small ingot molds under vacuum. It's a means of conducting alloying under precise control at maximum efficiency because all oxygen and reactive gases are removed from the chamber before the process starts. The furnace incorporates devices for making bulk additions of alloying constituents at the proper time during the melt—through pre-loaded hoppers within the chamber that are filled when the main charge is loaded in the crucible

FIELD REPORT



On the skids . . .
. . . at Republic Steel Corp's Buffalo plant, this huge, 2000-ton heat treating furnace was built 100 ft away from the 14-in. bar mill it serves, then was slid 100 ft over the four steel beams into position in the foreground. The furnace is said to be one of the largest objects ever moved in the Buffalo area. Its installation is part of a major overhauling and refinishing job going on at Republic's biggest finishing plant. The 20-ft-high, 25-ft-wide, 80-ft-long furnace is equipped with closed circuit television to allow man at its discharge end to charge the furnace at the entry end, 80 ft away

One-side welding . . .
Consumable weld inserts join the ends of this missile air tank at Research Welding & Engineering Co, Compton, Calif. Inserts of 1722-AS make the root passes joining ¼-in.-thick heads to the 5/16-in.-thick body when fused with automatic inert-gas shielded tungsten arc equipment. Joint is completed by submerged arc welding

Calif; and **Daystrom Electric,** Poughkeepsie, NY . . . **Boice Gages, Inc,** Hyde Park, NY, has established a new manufacturing division in Los Angeles; it'll be known as **Boice Threads, Inc.** Complete facilities of the former **Gage Plating Corp** will be used to turn out thread plug and thread ring gages.

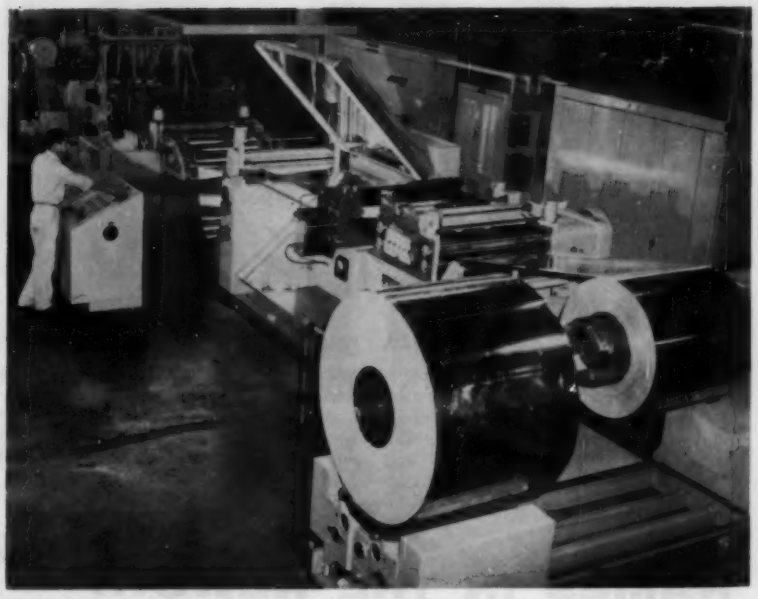
South . . .

Boeing is establishing a missile research and test center in Okaloosa County, Fla, near the Air Force's Eglin Field. It'll employ 600 . . . **United Specialties of Birmingham, Inc,** is shifting operations from Powderly, Ala, to a new quarter-million-dollar plant in Leeds. Company makes steel toy products . . . **International Harvester** will put up a $175,000 building to house its service and sales operations in Knoxville . . . **Marlette Coach Co,** Marlette, Mich, is beginning production of house trailers in a new 65,000-sq-ft plant in Americus, Ga . . . And in Augusta, two companies have expansion plans in the works: **Pure Air Products** is spending $1.196 million, and **Marks Oxygen Co,** $418,234 on enlargement of facilities . . . **Laclede Steel Co** of St Louis is building a $1-million fabricating plant and warehouse in Tampa Harbor, Fla . . . **American Machinery** (food packing and canning equipment) is enlarging Orlando, Fla, facilities . . . **General Electric** has begun to lay off (indefinitely) about 1200 workers in the refrigeration department of its Appliance Park plant in Louisville, Ky. Reason: deflation of an expected business upturn.

Midwest . . .

Timken Roller Bearing Co, Canton, Ohio, will boost prices of all tapered roller bearings an average of 6% on Oct 1. Company says increase is due to higher costs of labor, material, and supplies. **SKF Industries,** Philadelphia, upped its prices 5 to 7% in Sept; other major bearing producers are expected to fall in line . . . **Parker Appliance Co,** Cleveland, is buying all stock of **Hannifin Corp,** Des Plaines, Ill, producer of hydraulic and air power cylinders and presses. Price is $7.5 million . . . **Ohio Piston Co,** Cleveland, is changing its name to **Ohio Piston & Machining Co** as part of a diversification program begun last year. Company is equipped to machine parts other than pistons . . . **Philco Corp** has closed down and will sell its Bedford, Ind, plant. Manufacture of compressors and evaporators made there has been subcontracted to **Tecumseh Products Co,** Tecumseh, Mich. Company feels it's more economical to either make all their own compressors, or buy them all; it's been purchasing about 50% from other companies . . . **GM's Buick Division** at Flint, Mich, has ended production of 1957 cars, will start on '58s Oct 1. Some 10,000 workers will be furloughed during changeover . . . **Inland Steel** has a multi-million-dollar expansion program in the works that'll double output of wide flange beams, in short supply nationally for some time . . . Chicago's **Tool & Die Institute** will be housed early next

Window-frame wrinkle . . .
Conveyor system rigged to hydraulic press brake to turn out aluminum window frames at Coast Aluminum Co, Gardena, Calif, works this way: extrusions are positioned in brake in double rows, then progressive dies simultaneously punch guide holes in back row, cut front pieces into four lengths



Canmaking lines for the West . . .
Test-running the canmaking industry's first Western lines for processing tinplate from coils at American Can Co's Oakland, Calif, plant. High-speed lines (up to 600 linear ft of steel per min) give the new plant an annual output capacity of 200,000 tons of canmaking steel per year. Lines automatically inspect and shear coil steel into rectangular sheets in preparation for lithography or direct manufacture into plain cans. Each 15,000-lb steel coil is capable of making 70,000 standard-size food cans. Similar equipment will be installed in seven other Canco locations in the U S, part of a $27-million program

year in a new building now going up on Laramie Ave and Montana . . . **White Sewing Machine Corp** plans to sell its main plant in Lakewood, Ohio, move some equipment into its former factory building near downtown Cleveland. When move is completed, operations will include a small sewing machine division, and production of glass fiber products, vacuum cleaners, some defense orders . . . **Allis-Chalmers** has opened its new St Louis, Mo, branch facility on a 10.5-acre site northwest of the city in Hazelwood. It'll handle complete line of construction machinery equipment as well as farm equipment for distribution to dealers . . . And **Parker Rust Proof Co** of Detroit has opened its new plant in St Louis, a 40,000-sq-ft structure providing manufacturing and warehouse facilities for its metal surface treatment products . . . **Jones & Laughlin Steel Co** is negotiating purchase of the Lebanon, Ind, plant of **Geuder, Paeschke & Frey Co,** Milwaukee. Firm, employer of 250-300, makes wash tubs, buckets, and other household items.

West . . .

Northrop Aircraft has set up a new division, **Nortronics,** that will concentrate on design, development, and manufacture of electronic, electromechanical, and opto-mechanical products and components . . . **Tapered Air Products Corp,** Lynwood, Calif, has a contract (dollar value undisclosed) from **Boeing Airplane** for wing structural components to be used on the B-52 Stratofortress. **Tapered** is large fabricator of milled structural components . . . **Litton Industries** is training workers in temporary facilities in Salt Lake City to work in its new electron tube plant being built on a 10-acre site near the city airport. It'll employ 200 in the first 20,000-sq-ft unit, scheduled for Feb 1 completion. Plant is being built on modular basis for triple expansion . . . **Ling Electronics,** Los Angeles maker of electronically driven vibration test systems for aircraft and missiles, is putting up a 38,000-sq-ft plant in Culver City. Operations will go on at present facilities in Los Angeles, Glendale, and Burbank . . . **Pacific Airmotive Corp** has laid off 250 workers from its 1200 payroll at the Chino, Calif, plant—due to Pentagon cutback order . . . New aluminum reduction plant of **Harvey Aluminum,** going up at The Dalles, Ore, will be in partial operation early next year. It's scheduled for capacity rate of 108 million pounds annually . . . **Garrett Corp's** new **AiResearch** pneumatic controls building in Phoenix, Ariz, opened early this month. Workers (500) are turning out precision controls for air, liquids, and gases for commercial and military aircraft, as well as missiles and rockets . . . **States Steamship Co,** San Francisco, has a $150-million ship-construction program in the works. It calls for 13 new ships, first two to be delivered by Jan 1961, four more the following year. Company recently obtained a 20-yr subsidy contract from the government . . . **Universal Harvester** is enlarging at Stockton, Calif, to make room for a new product—a variable speed drive.

Paul W Leming has been elected executive vice president of the Van Norman Machine Co Division of Van Norman Industries. He was formerly works manager of King Machine Tool and Elmes Engineering Divisions of American Steel Foundries

Milton J Steffes, vice president, sales and engineering, of the Super Tool Division of Van Norman Industries, has been advanced to vice president and works manager. **Lawrence A McDonald** has been appointed sales manager

Robert R Rodehamel, general sales manager of National Acme Co, has been appointed vice president and general sales manager

NAMES IN THE NEWS...

James J Nance, vice president in charge of marketing for Ford Motor Co, and former president of Studebaker-Packard Corp, has been named vice president and general manager of the newly consolidated Lincoln-Mercury Division. **Ben D Mills,** who formerly headed the Lincoln Division, has been appointed assistant general manager of the new division, and remains a Ford vice president. **F G Reith,** former vice president and general manager of the Mercury Division, is being appointed to another executive position in the company. **Charles R Beacham,** general sales manager of Ford Division, has been elected a vice president of the company and assistant general manager of the division.

N J Kassnel, vice president of the Verson Allsteel Press Co, Chicago, has been named district manager of the company's newly opened Cleveland sales office.

J A Bradner has been promoted from assistant to manager of the Cri-Dan Division of Lees-Bradner Co.

William Nelson has been named president of Hall-Scott, Inc, Berkeley, Calif. He replaces **Rear Adm Robert A J English** USN (ret).

Robert J Jeffries, assistant to the president of Daystrom, Inc, Murray Hill, NJ, has been elected president of the Instrument Society of America.

Donald F Taylor has been promoted from assistant to general manufacturing manager of GM's Buick Motor Division. He succeeds **Jesse L Powers** who has retired.

Edmund Sylvester, former president of Griffin Wheel Co, Chicago, has been elected president of the American Ship Building Co, Cleveland. He has recently been serving as chairman of the executive committee, a post that is being taken over by **Herbert P Ladds.** Mr Sylvester succeeds **Robert B Ackerman** who has retired after 40 years' service with the company.

Lester A Shea has been appointed eastern division manager of Lindberg Industrial Corp, headquartered in Fair Lawn, NJ.

L D Deal, board member, secretary, and treasurer of Lyon Metal Products, Inc, Aurora, Ill, has been elected president of the company to succeed the late **H B Spackman.**

John R Poyser, Jr, has been named works manager of Leece-Neville Co. He was formerly consulting engineer with A T Kearney & Co, Chicago

Lyle L Lenth, general superintendent of the A B Farquhar Division of the Oliver Corp, has been appointed plant manager

Robert C Bevis, assistant to the sales manager of Cincinnati Milling Machine Co, has been appointed assistant sales manager, domestic

Edward P Gillane, president of Pratt & Whitney Co, and board chairman of Potter & Johnston Co, has also been named executive vice president in charge of industrial operations for Penn-Texas Corp. P&W is a Penn-Texas subsidiary

J William Robinson has been named president of Leeds & Northrup, Canada, Ltd, recently organized L&N subsidiary. He was formerly coordinator of western operations for the parent company

Jay E Watson, authority on gage standardization, and chief of the Ordnance Gage Center at Frankford Arsenal, has been appointed chief engineer, conventional gages, of Pratt & Whitney Co's Gage Division

James R McConnell has been appointed to the new post of manager, abrasive sales, for Pangborn Corp, Hagerstown, Md, manufacturer of Rotoblast equipment.

John Petrovich, associated with Mohawk Tools, Inc, (Montpelier, Ohio) in various capacities for the past seven years, has been named sales manager and assistant to the general manager.

Charles A Keller has been appointed director of the Production Division for AEC's Oak Ridge Operations. Mr Keller, who has been deputy director, succeeds **Ray C Armstrong**, recently named assistant manager for operations.

D J Bond, former Detroit district manager of Lapointe Machine Tool Co, has joined Colonial Broach & Machine Co, Detroit, as sales representative of the Special Products Division.

Wilfred Quinter has been promoted to production foreman of Northwestern Tool & Engineering Co, Dayton, Ohio. **James Wallace** is new inspection and quality control supervisor.

Chester A Sellen, assistant general manager and chief metallurgist of the Reliance Division of Eaton Manufacturing Co, has been named divisional general manager. He succeeds **E D Cowlin** who has retired.

John F Hack has been appointed customer service manager, fabricated products, of the Western Brass Mills Division of Olin Mathieson Chemical Corp. He was formerly central area manager, industrial and military department, of the company's Winchester-Western Division.

R D Bradford, vice president of American Smelting & Refining Co, has been named to head up the company's Federated Metals Division which has 24 plants in the US.

William A Schubert has been named engineer in charge of rotary compressor sales for Allis-Chalmers Manufacturing Co. He has been serving as application engineer in the compressor department.

Robert K Stern has been named president of Mid-Century Instrumatic Corp, New York manufacturer of analog computers. Mr Stern was formerly associated with Fischer & Porter Co, Hatboro, Penna, as a vice president and general manager of the Data Reduction and Automation Division.

B J McNamara has been named manager of sales and services for United Aircraft Corp's Pratt & Whitney Aircraft Division.

Robert E Thomas has rejoined Cleveland Cap Screw Co as general sales manager. He has been sales manager of Triplex Screw Co for the past two and a half years

C Cone, chief engineer, Surface Combustion Corp's Industrial Divisions, and **J I Trimble**, chief engineer Janitrol Divisions, have been elected vice presidents of the company.

Roy E Wendahl, vice president of Hughes Aircraft Co, and manager of Tucson operations, has been named to the new post of vice president, sales. He will make his headquarters at the company's Culver City executive offices.

Richard D Cleaves has been named vice president and general manager of Cochran Continental Container Corp, Louisville, Ky, owned jointly by Continental Can and Cochran Foil Co of Louisville.

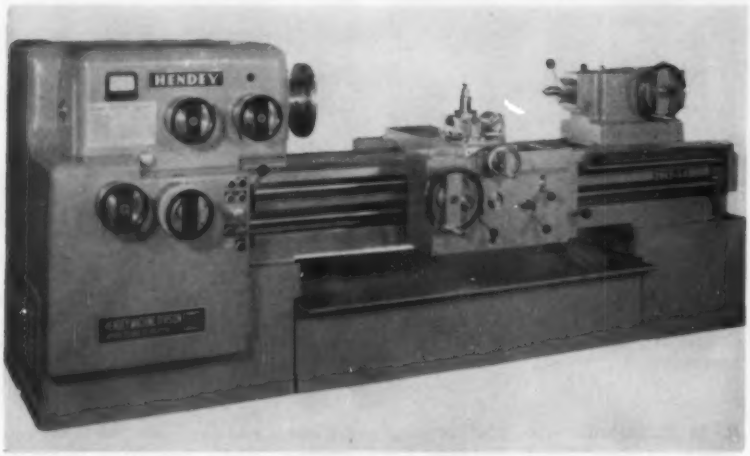
Madden T Works has been appointed manager of operations of Dresser Industries' Turbodrill Division, Dallas. He is former president of Pioneer Specialties, Inc, Houston manufacturer of oilfield equipment.

Edward F Kurzinski, formerly laboratory division head at Linde Co, and an expert in the field of process metallurgy, has joined Air Products, Inc, Allentown, Penna, as manager of sales development engineering.

C Hart Miller has been elected executive vice president and general manager of the Sierracin Corp, Burbank, Calif, producer of plastic products for aircraft. Mr Miller recently resigned as vice president of administration of Northrop Aircraft's Northrop Division.

Richard W Holmes has been named sales manager of E F Houghton & Co's eastern division, with headquarters in Worcester, Mass.

NEW SHOP EQUIPMENT



Hendey Introduces New Line of Versatile All-Geared-Head Lathes

New line of 32-speed, all-geared-head lathes for toolroom and production turning features two models: Model 2013 (illustrated) with 21-in. swing over bed ways and Model 2516 with 25-in. swing. These models were formerly called 16 and 20 in. sizes.

All-geared head makes available 32 spindle speeds from 13 to 1500 rpm. It is also available with maximum speeds of 1000 or 2000 rpm. Spur gears permit a large number of speed changes by merely shifting gears, reducing the number of headstock clutches. Automatic filtered lubrication is provided throughout the headstock.

Two-speed tailstock permits rapid centering of work for high-speed turning. The large 4½-in.-dia hardened and ground, tang-slotted tailstock spindle has 10-in. travel, and a slow speed for counterboring and fast speed for reaming or rapid positioning.

Toolroom versatility is shown by full complement of threading features:

- Multiple-thread indexing spindle permits cutting any number of threads divisible by 48.
- Built-in thread-chasing dial permits operator to move carriage quickly back to any position when cutting an even or odd thread.
- Quick-change spur gears give 66 thread and feed changes selected through two dials on gear box. Quick-change threads per inch range from 2 to 120. Feed range is from 0.0015 to 0.091 ipr.
- Two micrometer carriage stops provide close control of carriage travel in either direction, for r-h or l-h threading.

The extra-heavy bed casting is made of dense, wear-resistant, semi-steel, and all bed-way surfaces are induction hardened and ground. Lathes can be furnished with a 15, 20, or 25-hp spindle drive motor and come equipped with a load meter and spindle speed selector plate.

Barber-Colman Co, Hendey Machine Div, Rockford, Ill

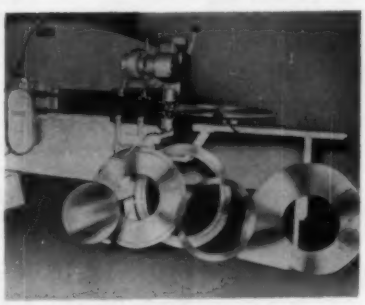
Long-Lasting Abrasive Tools are Made with Tungsten-Carbide Grits

New abrasive, designated Perma-Grit T-C, is fabricated by brazing tungsten-carbide grits on steel sheets, rods, sleeves, and wheels. Six types of tools are now available: toothless circular-saw blades, grit shoe for powered orbital sanders, hand sanders, grit files, and grit sleeves and rods for spindle sanders. Rods are available in ⅛, 3/16, and ¼-in. dia; sleeves, ¼ to 3-in. dia. Company estimates tools will save industry millions of dollars annually, as it obsoletes sandpaper in many industrial applications.

Among other applications, the tools are expected to find wide use in the plastics industry, and in the pattern and plastic shops of aircraft and automotive plants. If abrasive loads after long use it can be cleaned and restored to efficiency with solvents and/or a wire brush.

Prices for rods and sleeves range from $1.75 to $9; saw blade, $12.95; hand sander, $3.45; grit shoe, $2.95; grit file, $2.25.

Skil Corp, 5033 Elston Ave, Chicago 30, Ill



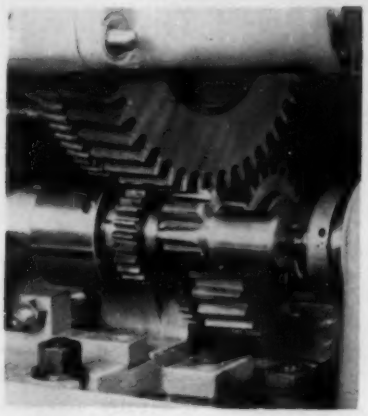
Outside Circle-Cutting Device Attaches to Pullmax Machines

Outside attachment, designed for use with Pullmax Models P-3, P-5, P-7, and P-9 universal shearing and forming machines, permits the cutting of circles of unlimited diameter as well as rings and large radii. Another use is for straight shearing. By employing two straight guides and a power feed (available on P-7 and P-9 machines), it is possible to cut large sheets, and inside square holes in heavy plate.

Included with the attachment are a guide rail and center pin. Attachment is normally supplied in 4-ft lengths but any length may be obtained. Fastened to side of machine, attachment swings out of way when not in use. Literature available.

American Pullmax Co, 2455 N Sheffield Ave, Chicago 14, Ill

MATERIALS AND PARTS



Rotary Shaving Machines Shave And Deburr Sector Gears

To carry out the simultaneous sector gear shaving and deburring operation on standard Red Ring rotary shaving machines, an entirely new type of rotary deburring tool has been developed. This HSS tool has a conical involute tooth shape and meshes with the gear segment. The form of the deburring tool teeth at their root portions is designed in such a manner that the shaving burr at the OD of the sector work gear is removed as it is produced.

The deburring tool is mounted on an auxiliary spindle on the table at the rear of the shaving machine head and tailstocks. Proper timing relationships between the conical involute (tapered tooth) shaving cutter, work driving head and deburring tool are achieved by a gear train.

Illustration shows a steering gear segment being shaved and deburred. When cycle start button is pressed, segment is fed back and forth on a 90° traverse and fed to depth in increments at the ends of the stroke to shave teeth to finished size.

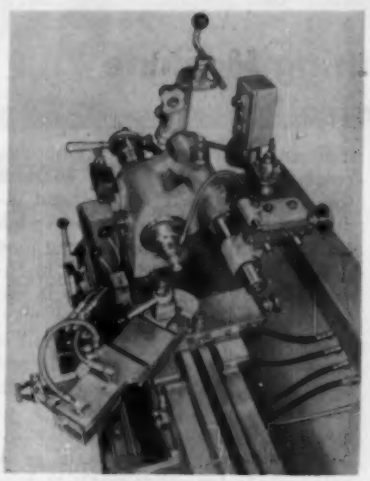
National Broach and Machine Co, 5600 St Jean Ave, Detroit 13, Mich

Compact Radiography Machine Weighs Only 40 lb

Radiography machine, designated Iriditron 40, has the penetrating power of a 400,000-volt X-ray machine yet weighs only 40 lb. It employs radioactive Iridium 192 in strengths up to 30 curies for the non-destructive inspection of metals and other materials. This is equivalent to 20,000 mg of radium.

Unit has a 25-ft flexible source tube and a 25-ft control cable which is operated mechanically to release and replace the radioactive source for necessary exposure times. A Source Position Indicator shows the exact location of the source at all times. Design is such that machine cannot be locked unless source is properly positioned within the shield. Machine meets all safety requirements of AEC and ICC.

Budd Co, Nuclear Systems Div, 2450 Hunting Park Ave, Philadelphia 32, Penna



Improved Elgin Tracer Lathe Reduces Rejects to Minimum

New, improved tracer lathe is designed to duplicate pieceparts from either flat or round templets. Parts are said to be duplicated within 0.0003 in. Machine is provided with pushbutton starting for automatic cycle of carriage and spindle; and pushbutton stop of automatic cycle which returns carriage to starting position with tool and stylus retracted. During automatic cycle, a carriage limit switch initiates tool relief and returns carriage to start position.

Motor direction and speed are controlled by spindle-drive control levers. Speeds are infinitely adjustable from 120 to 2900 rpm. Longitudinal feed is controlled by lever.

Elgin Tool Works, Inc, 1770 Berteau Ave, Chicago 13, Ill

including...

MACHINE TOOLS AND ATTACHMENTS

Drilling Machine 188
Gear Hobber 190
Rotary Cutoff Machine 194
High-Speed Drilling Machine 198
Motorized Grinding Head 204

TOOLS AND ACCESSORIES

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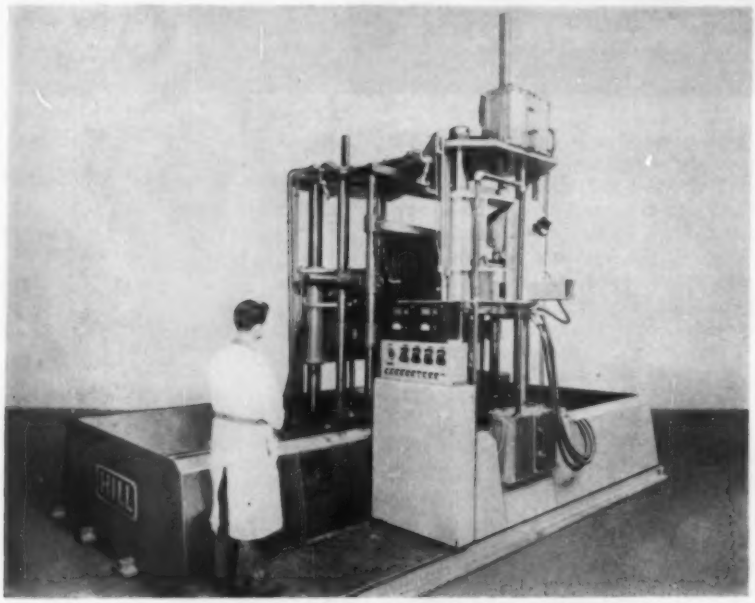


Opposed-Spindle Drilling Machine Is Automatically Controlled

This opposed-spindle drilling machine features a lowcost, flexible, automatic system for positioning heads and table to produce hole patterns. Designed to drill holes in condenser tube sheets and baffles, heat exchangers, evaporators, and all types of heat transfer equipment, machine handles sheets and baffles up to 6-ft dia and 10 in. thick and produces holes at feed rates up to 18 ipm with conventional oil-flute drills. Uniform, straight, round holes are produced in a single operation without reaming. With the new positioning system, sheets and baffles can be drilled separately or stacked with assurance of accurate alignment at assembly.

Positioning system is applied to both head and table indexing. Vertical and horizontal indexes are controlled by individual escapement wheels. Different hole spacing for various parts is obtained by inserting suitable change gears between shaft and escapement wheel.

Machine has two opposed hydraulic-power heads that travel vertically on a pair of 6-in.-dia steel columns. Work fixture is mounted on table. Hardened, self-contained roller followers guide the fixture during indexing and maintain fixture alignment with the drill heads to prevent oval or barrel-shaped holes.

Individual hydraulic cylinders index the heads and table. In a typical drilling operation the two heads are indexed vertically to locations corresponding to two rows of holes in the desired pattern. As the head index cylinders raise and lower the heads in unison (one up and one down) the escapement wheel is rotated to next position. Table is positioned horizontally in same way.

When drilling starts, each drill is fed through the sheet and retracted to complete drilling of one hole in each of two rows. Then table is indexed to next hole position. By manual selection, the automatic cycle will provide for either single or double-position index to facilitate square pitch or diamond pattern drilling. When rows are completely drilled, machine is stopped automatically by a preset counter. Heads and table are then indexed to the next drilling position and counter is reset.

The heads, which can develop an 18,000-lb thrust force, have 4-in.-dia spindles supported in a long steel sleeve by tapered roller bearings. Each spindle is driven by a 15-hp motor through a 4-speed selector drive. Spindle travel is 12 in.; feeds are adjustable up to 24 ipm.

A pushbutton panel with both individual and automatic cycle controls includes load meters which retract drills if hard spots cause overloads above a preset amount. Meters can be set to suit load conditions.

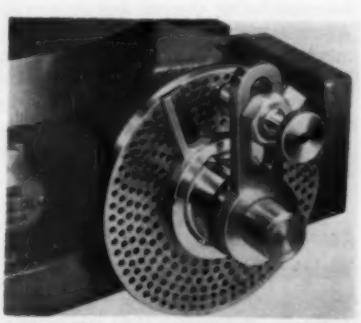
Walter P Hill, 28183 Telegraph Rd, Detroit 19, Mich

Fully Automatic Positioner Is Designed for Welding Titanium

Model 21TS Titanium Special welding positioner is a fully automatic unit which provides a gas-tight seal plate under the 60-in.-dia, 8-slot table. The seal plate is 64 in. in diameter and allows the user to place a plastic, gas-tight dome over table and workpiece to weld in a gaseous atmosphere. Table-tilt gearmotor and elevation gearmotor are equipped with magnetic braking and fully adjustable limit switches.

Table rotation drive is infinitely adjustable over the range 0 to 2.7 rpm and has a fast positioning speed of 4 rpm. The table tilts 135° in 23.4 sec and elevates 24 in. in 15 sec. Load capacity is 5000 lb with center of gravity 6 in. above table, 4 in. off-center. Rotation torque is 20,000-in.-lb. The heavy-duty steel base is equipped with 8-in., heavy-duty V-groove casters, 2 swivel and 2 rigid, for portability on track.

Aronson Machine Co, Arcade, NY



DIVIDING ATTACHMENT fits all models of Universal's rotary tables. Divisions obtainable are 2 to 63 inclusive and 27 additional divisions to 100 (others by formula)—*Universal Vise & Tool Co, Parma, Mich*

Radically Designed Fork-Lift Truck Does Away With Mast Assembly

The Automatic Transportation Co has introduced a new heavy-duty fork-lift truck called the Elbolift that does away with the conventional mast assembly and offers lower over-all weight and greater visibility. It has a capacity of 12,000 to 20,000 lb and a maximum lift of 10 ft.

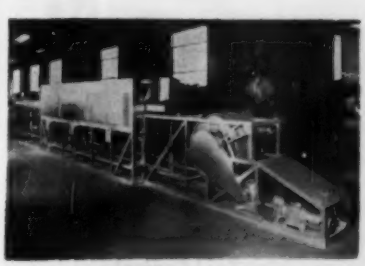
Special compensating linkages permit loads to be lifted vertically. This is in contrast to the standard bucket-type loader which travels through an arc because the end of the lifting arm is mounted on a fixed pivot at the rear. In order to facilitate tiering, this truck, first in company's MF series, offers a 10° back and 5° forward tilt—another feature not found in trucks of comparable capacity.

Operator mounts from rear and is well protected—on the sides by the counterweight and in the rear by a heel plate. An exclusive power steering control eliminates all guess-work. The operator always knows the exact position of his steering wheels by the position of the handle which indicates the direction the wheels turn.

Unit is equipped with manually adjustable forks as standard equipment. Hydraulically adjusted forks, side shifter, and ram may be obtained as single or combination attachments for use in handling dies, pallets, platforms, and coils. The battery compartment has rollers for easy battery removal from either side.

It has four speeds—either forward or reverse—with foot inching to any preset or selected speed. Truck has an over-all height of 80 in., width of 48 in., and two 16-in.-wide tires. Company claims that the ratio between lift and over-all height is the highest of any industrial truck in the field.

Automatic Transportation Co, 149 W 87 St, Chicago 20, Ill



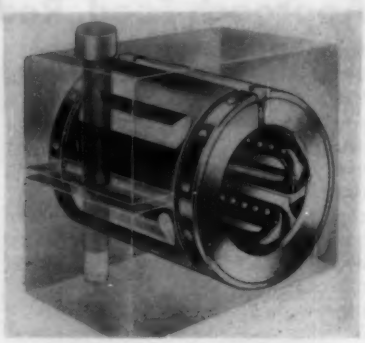
Pereny Offers Sectionalized Oxide Reduction Furnace

Sectionalized metal oxide reduction furnace is latest addition to company's line of industrial furnaces. Prototype is equipped with an endless feed belt of mild sheet steel. However, slight modification and use of an alloy mesh belt permit use of furnace for applications other than powdered metals.

The four sections of the furnace include the belt drive and drum, complete with adjustable pinch roll and entrance hood; high temperature zone; cooling section; belt drum and take-up assembly and exhaust hood. Unit is complete with all controls, and requires only connection to utilities after sectional assembly.

Maximum operating temperature range is 1900 to 2000 F. Belt speed is variable from 5 to 50 fph. The Inconel muffle, which runs the length of the heat zone, is 16 in. wide and 3¾ in. high. Over-all size of the furnace is approx 3 ft 10 in. wide x 6 ft 1 in. high x 38 ft long.

Pereny Equipment Co, 893 Chambers Rd, Columbus 12, Ohio



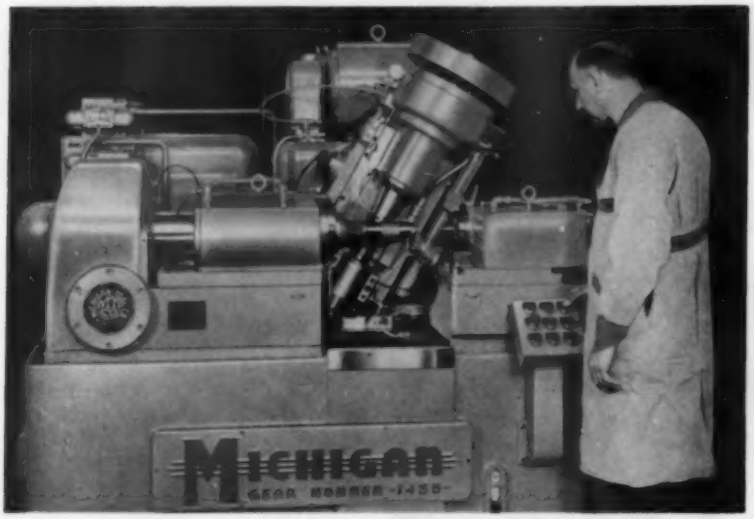
Linear Bearing Permits Free-Running No-Play Linear Motion

New type ball bearing for linear motion, designated the Adjustable Diameter Ball Bushing, is split longitudinally as illustrated and is designed to provide line-to-line or slight preload fits when mounted in an adjustable-diameter housing.

Bearing enables the tolerance on both shaft diameter and bearing bore to be adjusted out. In addition, principle provides for wear compensation. Often the bearing is used in a housing that is merely split and provided with an adjusting screw. Drawings are available showing arrangements being used in design of machine tools, special machinery, precision mechanisms, and many other devices in which free linear motion is desired and shake or play is detrimental.

Unit is available in standard sizes for shaft diameters from 1 to 4 in. Literature available on request.

Thomson Industries, Inc, Manhasset, NY



High-Speed Gear Hobber Eliminates Approach Feed, Reduces Hob Time

Model 1458-B high-speed gear hobber, latest addition to company's Ultra-Speed line, is a horizontal single-spindle machine that is versatile enough for small shops, yet easily installed in automated gear lines of big plants. It has an 8-in. center distance between hob arbor and work spindle. Entire hobbing cycle is fully automatic with the machine returning to the loading position upon completion of the part. Loading and cutting time for most gears is measured in seconds. Either conventional or climb hobbing may be used with single or multiple-thread hobs.

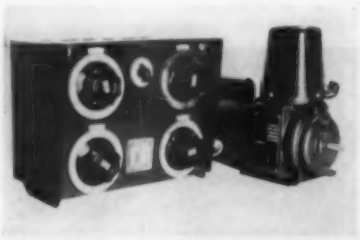
An inboard-mounted guide assembly introduces the lead to work spindle while work is being traversed across the hob. The guide facilitates straight gear hobbing; for spiral gears it controls the helix angle being cut. Machine hobs up to 4-pitch spur or helical gears. Maximum crossfeed stroke of hob is 5 in. Either r-h or l-h helix angles up to 35° can be hobbed.

In operation, hob is plunge fed into the work by a "Z"-bar mechanism, eliminating the approach feed and offering a reduction in hob time. This mechanism can be disengaged for conventional approach feed. Plunge feed is infinitely adjustable from 0 to 0.800 in. and is hydraulically operated and controlled. Work rotation is controlled from a preset timed relationship with the hob through change gears.

Two 5-in. hydraulic cylinders, mounted on the same dovetail slide as the work-spindle assembly, provide power for cross feed. Hob spindle is housed in a dovetail slide that moves up and down for hob shift. Hob shift is hydraulically actuated and infinitely adjustable in increments from 0 to 0.100 in. up to max of 4 in.

Unitized construction is used—all assemblies being mounted on a common surface of the base. Lubrication is pressure fed to all vital parts and recirculated through a cartridge-type filter. Coolant reservoir is in machine base. Optional equipment includes an automatic expansion arbor for workholding and a size control mechanism which adapts to the "Z"-bar infeed mechanism.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich

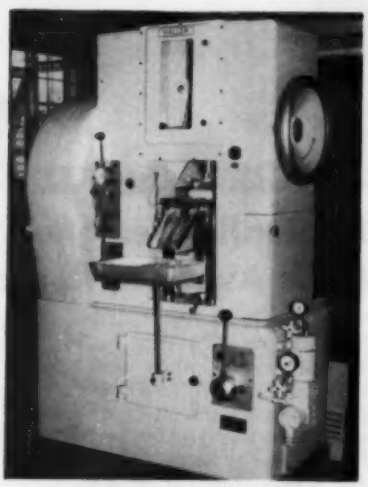


Program Controller is Adaptable To Machine Tool Control

New sequence control, called the Sequentrol, establishes a number of functions that must take place in a predetermined order to preset values. Among its applications are machine tool and welding positioner programming, work station control for assembling machines, and dipping machine programming.

A vernier dial or revolution-counter-type control is set on the Sequentrol panel for each position or rate that is to be established. In programmed sequence, each dial or counter assumes command of the setting of a Shaftrol operator (*AM*—Feb 11 '57, p188). Sequentrol, designed to handle operators up to 10 hp, may receive commands from controls set at panel as shown, or from remotely located potentiometers, or from punch card reading devices. Reset accuracy on standard models is 1/5 of 1%. Bulletin J-100.

Jordan Co, Inc, 3235 West Hampton Ave, Milwaukee 9, Wis



Hydraulic Pressure System Aids Mechanical Compacting Presses

System is said to simplify and control pressing to density powdered metal and ceramic parts. It is available for the 8, 13, 18, and 40-ton models of Haller compacting presses.

Side-mounted unit consists of an oil-filled accumulator charged to 100 psi with nitrogen; a sandwich-design check valve; and a relief valve. Pressure accumulated in the tank is applied on the piston carrying the lower ram of the press. Relief valve remains closed until desired pressure has been reached. Then the oil bypasses into the accumulator. The 100-psi pressure in the accumulator forces the oil back into the cylinder to return the piston and lower ram to the fill position. Gage with maximum-read hand indicates in psi the pressure used in the cylinder at each stroke of the press.

Haller, Inc, 684 Ann Arbor Rd, Plymouth, Mich

No other single machine performs such a variety of operations in one set-up

It takes several machines to do all that's now possible with just one BOKOE No. 3 Universal Milling and Boring Machine. Because no other machine combines all these versatile features—for non-ferrous, cast iron and alloy steel tooling, patterns and production to close tolerances:

Large work table and deep throat handles many jobs in one set-up. Easily accessible for bulky parts up to 8' 2" dia.; distance between column slide and spindle center 37½". Automatic controls on work table provide 28" traverse and 55" longitudinal movement; table feeds infinitely variable from 4" to 39" per min.

Circular milling with automatic power feed for circular movement of work table infinitely variable from 7" to 70" per min. (at a diameter of 40"), for continuous rotary milling as well as for radius milling.

Variable speed changer with spindle speeds from 36-1800 rpm can be operated without stopping machine.

Swiveling column turns 180° horizontally in either direction . . . permits radial drilling in addition to vertical milling, universal milling and boring up to 11⅞" with large milling slide; six mechanical feeds and rapid travel. Milling head on column swivels vertically 90° in either direction.

Get to know the big BOKOE No. 3—how it is doing the work of several machines . . . more economically . . . for such companies as Convair (4); Ford (3); Motor Pattern (7); General Electric, Lockheed, General Motors and hosts of others. **Write for complete details.**

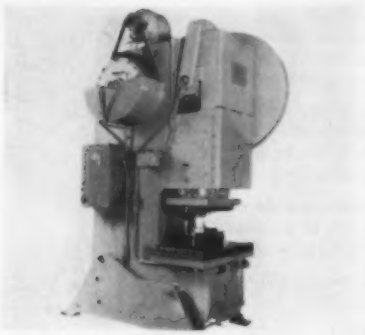
you'd need several machines to do all the different jobs you can produce on one BOKOE universal miller

Built-in circular table with power feed and tilting milling head is ideal for bulky work pieces. Also in smaller Model No. 2.

KO CO., INC. PRECISION MACHINERY

KURT ORBAN COMPANY, INC.

36 Exchange Place, Jersey City 2, N.J. • In Canada: 2490 Eglinton Ave. W, Toronto



OBI Mechanical Gap Presses Added to Farquhar Line

Press, said to be useful for both large and small production runs, is available in four capacities: 75, 110, 150, and 200 tons.

Long gibways for accurate slide alignment and box-type gibs are features of the new design. Easy wrench adjustment is provided at the die level. Slides are box-type welded steel to eliminate way deflections.

Unit has a V-belt motor drive as standard equipment with electric pushbutton safety controls. There are two "run" buttons and one "stop" button; both "run" buttons must be depressed on downward stroke for operator protection. Four-position clutch control provides for "off," "once," "inch," and "continuous" operation. Units are built to JIC standards.

A B Farquhar Division, The Oliver Corp, 126 Duke St, York, Penna

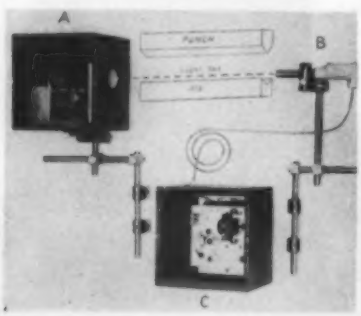
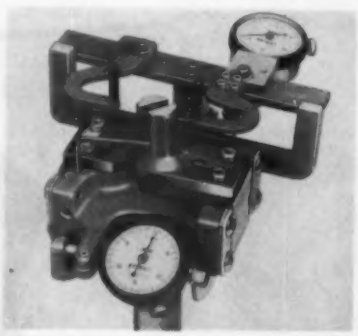


Photo-Electric Unit Triggers Press Brake Safety Device

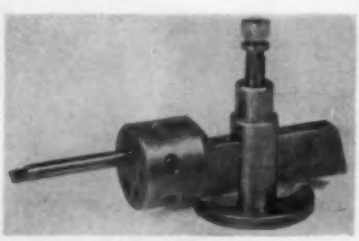
New safety control designed for press brakes and shears consists of three parts: light projector (A), photocell receiver or pick-up (B), and amplifier (C). The light projector is designed to produce a series of high frequency light impulses, using a rotating disk-type shutter. The photocell transforms the light impulses into electrical impulses and feeds them to the amplifier. Only light from the tuned light source and pick-up will operate the amplifier.

If the light ray, which passes between the punch and the die, is broken, the safety device will stop the machine. When the machine is equipped with a stop button and can be stopped at any point in the cycle, the relay in the amplifier is wired in series with this button. If the machine has a friction clutch the amplifier relay may be connected with a special solenoid-operated locking device to lock the clutch pull-rod and prevent machine from moving. Many other safety applications are possible. Literature available.

Searjeant Metal Products Inc, Box 42, Mendon, NY



THREAD-GAGE ATTACHMENT permits a face, shoulder, or counterbore to be checked for squareness in relation to a thread during machining as well as at inspection. Device attaches to any standard Bryant P-21 portable internal thread gage and permits a complete check of the internal thread at same time—*Bryant Chucking Grinder Co, Bryant Gage and Spindle Div, Box 620, Springfield, Vt*

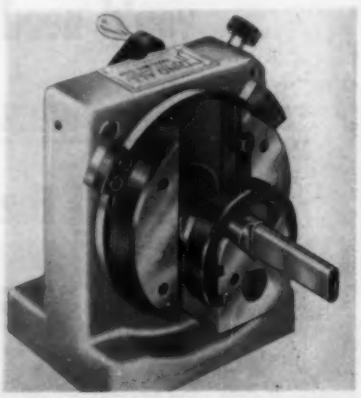


Index Boring-Tool Holder Reduces Lathe Setup Time

Toolholder, made of steel and case hardened to a depth of approx 0.030 in., accepts straight-shank boring tools in a variety of diameters. Smallest model, No. 1, accepts four different diameter tools—3/16, ¼, ⅜, and 7/16 in.—and has a 3¾-in.-long shank No. 2 holds six tools, from 3/16 to ½-in. dia; No. 3 holds six tools, from ⅜ to 1-in. dia, and has a 7-in.-long shank.

Two different types of indexing are available—the barrel can be slotted to fit the end of the shank or a ball-and-spring locating system may be specified. To index the barrel all the operator has to do is loosen the front screw, select the suitable diameter, and tighten. The tools may be adjusted in the holder to eliminate excessive overhang.

N C Thomsen Co, Tool Div, 1045 Pinecrest Dr, Ferndale 20, Mich



Harig Grinding Fixture Grinds Irregularly Shaped Punches

New, improved Grind-All fixture easily grinds irregularly shaped punches concentric with shank within ±0.0002 in. It can also be used for light milling and boring, radius dressing, and as an inspection tool. The hand-crank provides easy rotation of the index plate.

A single locking screw adjusts V-block to any desired position (former design required 6 locking screws). Device comes in a handy leatherette carrying and storage case.

Harig Mfg Corp, 5757 W Howard St, Chicago 31, Ill

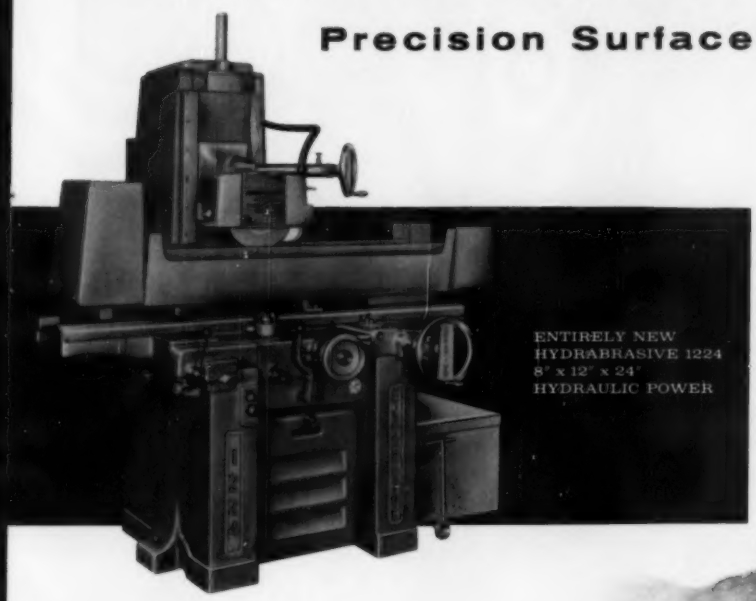
Carborundum Introduces New Mounted Wheel Line

Line of mounted wheels, incorporating V40 bond, is available in all standard shapes and sizes and in a complete range of gradings to meet all precision grinding requirements.

Units can be supplied with hard, nickel-plated mandrels in a variety of sizes to fit various chucks. Wall chart and descriptive folder are available.

Carborundum Co, Bonded Abrasives Div, Niagara Falls, NY

Tools and parts for the finest products in the world are ground on *ABRASIVE* Precision Surface Grinders



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HYDRABRASIVE 1224
8" x 12" x 24"
HYDRAULIC POWER

Proven unexcelled in advanced design, flexibility of capacities, modern features, effortless operation, precision accuracy, maintenance ease. Wherever you are . . . there is an Abrasive dealer nearby. Operation, construction and price information for the entire Abrasive line is immediately available upon request.

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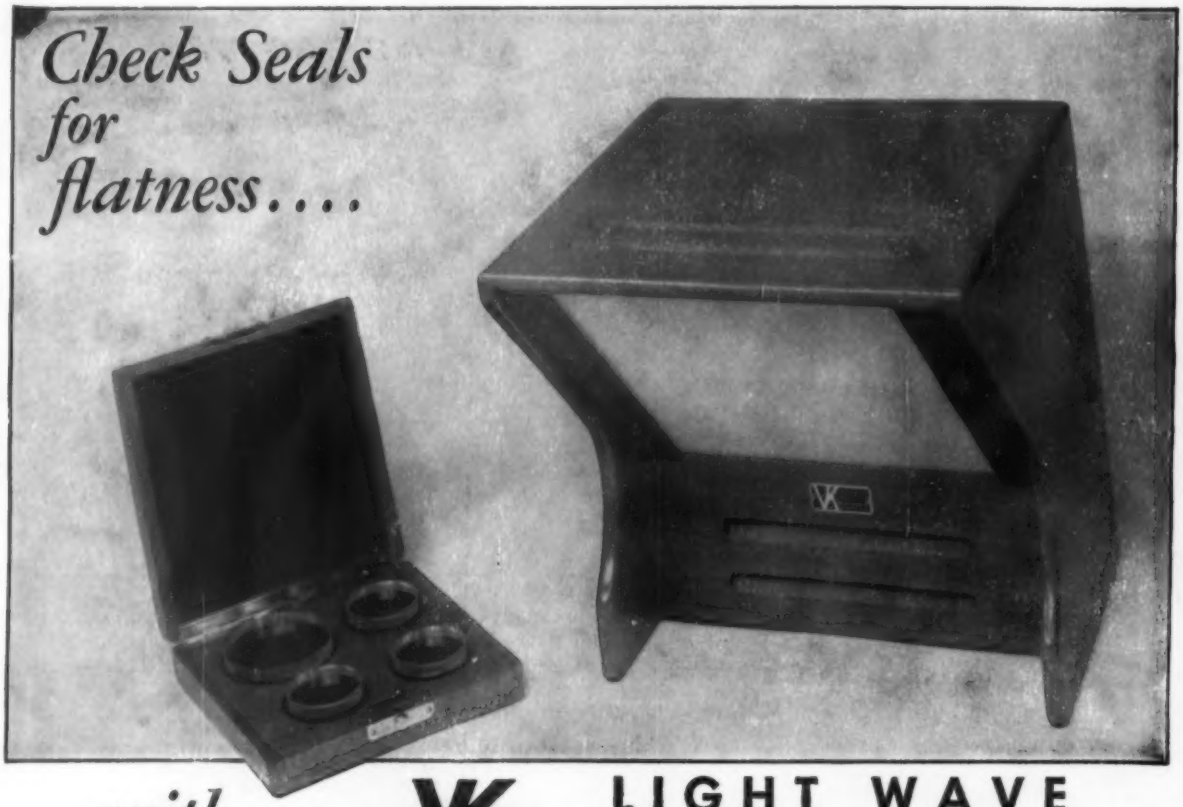
MACHINE TOOL COMPANY
EAST PROVIDENCE 14, RHODE ISLAND

Check Seals for flatness....

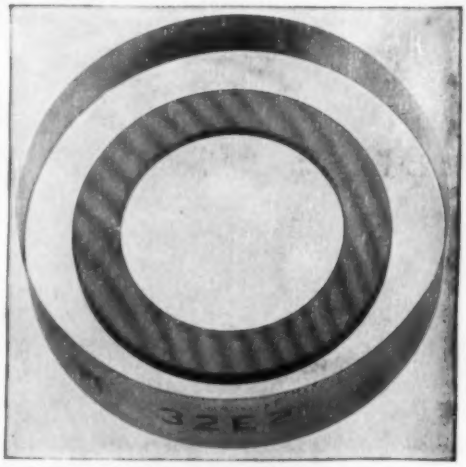


...with **VK LIGHT WAVE EQUIPMENT**

Van Keuren Light Wave Equipments, standard gage laboratory equipment everywhere, have long been used for checking gage blocks, toolmaker's flats, comparator anvils and other lapped surfaces in the laboratory or inspection room. In recent years, however, VK Light Wave Equipments and flats have become valuable tools on production inspection jobs. Typical is the growing use of optical flats in checking sealing rings of various materials.

The illustration at right of a sealing ring under a 3" diameter fused quartz optical flat shows how easily measurements can be made. The ring* is acceptable on sight. The bands indicate excellent surface finish (sharp definition of bands), and no warp or low edges (uniform band spacing). Flatness is within .000005" across entire ring, and .000002" across ring face (bands curve less than ½ band interval over entire ring, and 1/6 over ring face).

*Product of Sealol Corp., Providence, R. I.



VK Optical Flat and Seal Ring

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK

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173 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Carbide Pivots . . . Precision Lapping Service.

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MACHINES AND ATTACHMENTS

1 MILLING MACHINES—*Greaves Machine Tool Co, 2100 Eastern Ave, Cincinnati 3, Ohio.* Illustrated, wall-chart-type bulletin 119 contains detailed analysis of the 2-H plain and universal machines. Describes standard and optional equipment; specifications, speed-feed chart, floor plan included.

2 MILLING ATTACHMENT—*Dumore Co, 1300 Seventeenth St, Racine, Wis.* 28-page catalog VM-57 gives details on portable Versa-Mil. Operational data provided on basic unit and seven attachments, with application photos, for milling, boring, shaping, slotting, grinding, drilling, and related machining operations.

3 MACHINE TOOLS—*Walker-Turner Division, Rockwell Manufacturing Co, 400 N Lexington Ave, Pittsburgh 8, Penna.* 48-page catalog illustrates line of light-heavyweight units including saws, cutoff machines, drillpresses, grinders, lathes, spindle shaper, belt and disk surfacer, jointer. Capacities, speeds, dimensions, components listed separately for easy selection.

4 VERTICAL TRACER RIGIDMIL—*Sundstrand Machine Tool Co, 2531 Eleventh St, Rockford, Ill.* 6-page circular contains illustrated description of machine elements and features of 3-dimensional tracer miller. Specifications tabulated.

5 SHEET AND STRIP STRAIGHTENERS—*Waterbury Farrel Foundry & Machine Co, Waterbury, Conn.* 12-page catalog 320-T-5 pictures and describes roll feed straighteners with direct pinion drive; spindle-driven roll straighteners; back tension units; and specials.

6 MULTI-SLIDE MACHINES—*US Tool Co, Ampere (East Orange) NJ.* 16-page bulletin 15 covers four sizes of units for automatic production of stampings. Specifications listed; auxiliary attachments and typical applications illustrated.

7 BASIC MACHINES—*Baker Brothers, Inc, Toledo 10, Ohio.* 8-page bulletin 117 illustrates and describes how standard automation units can be retooled for different machining operations.

TOOLS AND ACCESSORIES

8 CARBIDE TIPS, TOOLS, INSERTS—*Firth Sterling, 3113 Forbes St, Pittsburgh 30, Penna.* 56-page illustrated catalog TTI-57 identifies each product, provides complete grade selection chart.

9 DIESETS AND BOLSTER PLATES—*E W Bliss Co, Die Supply Division, 1400 Brookpark Rd, Cleveland 9, Ohio.* 16-page illustrated booklet 70-A, (section 2) gives information on special diesets and bolster plates; includes ordering data, dimensional charts.

10 LATHE AND MILLING MACHINE ACCESSORIES—*Montgomery & Co, Inc, 7 Tichenor Lane, Newark 2, NJ.* 16-page catalog GN-2 pictures, describes, gives specifications for mandrels, centers, die heads, chucks for lathes; arbors, plates, vises, indexing tables for milling machines; and tapping attachments for drills.

11 BROACHES—*The du Mont Corp, Greenfield, Mass.* 16-page catalog lists 34 additions to line of Minute Man standard stock broaches. Keyway broach kits, specials, arbor presses and magnetic bases for dial indicators also covered.

12 GRINDING WHEELS—*Cincinnati Milling Machines Co, Milling Products Division, Cincinnati 9, Ohio.* 8-page illustrated booklet PG-341 covers features and applications of Centertype wheels. Includes table of suggested gradings for various center-type grinding operations.

HEAT TREATING AND WELDING

13 SPOT AND PROJECTION WELDERS—*Sciaky Bros, Inc, 4915 W 67th St, Chicago, Ill.* Bulletin 324-2R describes Type SP-1 spot and EP-1 projection units, both air-operated, press-type, low-imped-

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ance, single-phase models. Machine data tabulated to indicate kva range, throat depths, welding capacities, electrode forces.

14 HEAT-TREATING ACCESSORIES —*Wirtex Manufacturing Co, 10 Mason St, Bridgeport 5, Conn.* 16-page catalog M-7 gives details on alloy fabrications for use in high-temp ranges and extreme corrosion conditions. Units illustrated and described range from small baskets to hold jewelry parts to models to hold 5 tons. Specifications and applications included.

15 ALUMINUM JOINING PROBLEMS —*Eutectic Welding Alloys Corp, 40-40 172 St, Flushing 58, LI, NY.* 6-page technical bulletin TIS 2815 discusses welding, brazing, and soldering procedures designed to overcome or eliminate warping, distortion, cracking, and embrittlement. Fluxing procedures and control of oxidation described; welding rod and electrode characteristics for best results on all types of aluminum given in table form.

PLANT SERVICE EQUIPMENT

16 RUST PREVENTIVE CHART—*Pennsylvania Refining Co, Butler, Penna.* Chart lists military-specification corrosion preventives. Tabular data provided on solvent cutbacks, general purpose preservatives, lubricants for engine preservation. Cleaning methods, applications, removal procedures discussed.

17 AIR AND VACUUM PUMPS—*Leiman Bros, Inc, 102 Christie St, Newark 5, NJ.* 16-page catalog 757 describes rotary positive units, gas boosters, and air motors. Construction details, dimensions, capacities, performance curves, installations, accessories included.

18 SAFETY MANUALS—*Association of Casualty & Surety Companies, 60 John St, New York 38, NY.* Three booklets deal with specific job operation or hazard, describe inherent dangers, present safe practices and methods for avoiding or lessening hazards. One (32 pages) covers welding and cutting; a second (36 pages) covers blasting; third (18 pages) discusses electrical hazards.

19 STAINLESS STEEL FINISHING METHODS—*R G Haskins Co, 3651 W Harrison St, Chicago 12, Ill.* 18-page illustrated catalog gives data on grinding, sanding, string-wheel application, polishing and buffing, together with detailed information on techniques to be followed such as pressures, strokes, speeds. Recommended equipment covered.

20 SOLVENT FOR EQUIPMENT MAINTENANCE—*E F Houghton & Co, 303 W Lehigh Ave, Philadelphia 33, Penna.* 6-page folder contains information on Gum Solvent B, a flushing medium added to the lube or hydraulic system during machine operation to loosen sludges and hold them in suspension for draining in routine oil change.

21 BATTERY USERS MANUAL — *Gould-National Batteries, Inc, Trenton 7, NJ.* 44-page illustrated book (bulletin GB-1599A) covers every phase of maintenance, repair, and selection; charging method and equipment; testing and techniques. Diagrams and tables review battery theory and construction.

PARTS AND MATERIALS

22 O-RING HANDBOOK 5700—*Parker Appliance Co, Rubber Products Division, 17325 Euclid Ave, Cleveland 12, Ohio.* 160-page illustrated book covers design and application of synthetic rubber O-ring seals. Sections with tables and charts cover compounds and proper selection; engineering data; gland design; installation; static and dynamic seals.

23 PRECISION STRIP — *Precision Products, Inc, 501 Crescent Ave, Reading, Penna.* 12-page product directory deals with beryllium, copper, chromium copper, phosphor bronze, nickel silver, brass, stainless and nickel-iron strip rolled to close tolerances and thin gages. Tabular material covers availability, specifications, property data.

24 INVESTMENT CASTINGS—*Hitchiner Manufacturing Co, Milford, NH.* 14-page brochure details advantages of process; various steps in casting manufacture explained and illustrated.

25 BUSHINGS—*American Drill Bushing Co, 5107 Pacific Blvd, Los Angeles 58, Calif.* Catalog gives types and sizes, drill sizes with decimal equivalents, concentricity of bushings, Rockwell hardness.

26 HIGH-TEMP ALLOY—*Haynes Stellite Co, Division of Union Carbide Corp, 30-80 Thomson Ave, Long Island City 1, NY.* 24-page booklet contains properties information on Multimet alloy recommended for use at high stresses up to 1500 F and at moderate stresses up to 2000 F. Section describes methods for welding, forming, and machining.

27 AIR-OPERATED VALVES—*Conoflow Corp, 3100 Arch St, Philadelphia 3, Penna.* 8-page illustrated bulletin HB-6 gives construction details and operating characteristics of Series HB Saunders valves. Includes sizing data and listing of flow co-efficients to aid in proper selection.

28 PILLOW BLOCKS—*Dodge Manufacturing Corp, Mishawaka, Ind.* 8-page bulletin A668 describes Spher-Align (spherical roller bearing) units. Photos, engineering drawings, tabulated data on dimensions, shaft sizes, weights, and radial load ratgins, applications, replacement parts.

29 COLD FINISHED STEEL BARS—*LaSalle Steel Co, PO Box 6300-A, Chicago 80, Ill.* 5-page Wall chart lists all AISI grades (241) available; gives chemical analysis, machinability ratings in sfpm; table gives weights in pounds per foot for round, square, and hexagon bars of thicknesses or diameters from 1/32 to 6 in.

30 AIDS FOR MACHINING ALUMINUM—*Kaiser Aluminum & Chemical Sales, Inc, Box SMS, 919 N Michigan Ave, Chicago 11, Ill.* Guide indicates approximate cutting speeds and feeds with standard automatic screw machine tools. Calculator gives pounds per 1000 pieces of hexagonal and round stock ranging from 1/8 to 1 5/8 in.; lists typical mechanical properties for aluminum screw machine stock including 2011, 2017, 2024, and 6061 alloys. Loose-leaf manual contains fundamentals on machining in the form of 9 operational reports, supplemented each month.

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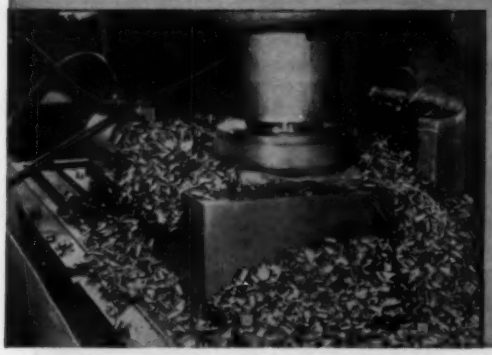

DETAILS OF JOB ILLUSTRATED

Machine	Sundstrand Rigid Mill
Cutter Size	10" Diameter
No. of Teeth	12
Carbide Inserts (grade)	Carmet CA-610
Rate of Travel	400 S.F.P.M.
Table Speed	10 in. per minute
Depth of Cut	½ inch
Material	1095 Cold Drawn Shank Steel, 200 Brinell

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Complete Technical and Shop Data on the Carmet "CA-600 Series" of special steel-cutting Carbides

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ADDRESS DEPT. AM-931

Here's something *special* for you: the new Carmet steel-cutting grades of carbide, called the "CA-600 Series." One of the grades is shown above in a milling operation—a tough job where the major requirement was continuous production. Cutters equipped with Carmet CA-610 inserts not only increased the production of the machine on this job, but actually gave 50% longer life than the comparable cutting materials previously used.

These heavy-duty CA-600 Carmet grades (premium products in performance, *at no premium in price*) have been thoroughly job-proved in the field. They're available to fit *your* steel-cutting requirements . . . *let us arrange a demonstration of their ability to save time and money for you.* Get in touch with your nearest A-L representative or distributor, or address ***Allegheny Ludlum Steel Corporation, Carmet Division, Detroit 20, Michigan.***

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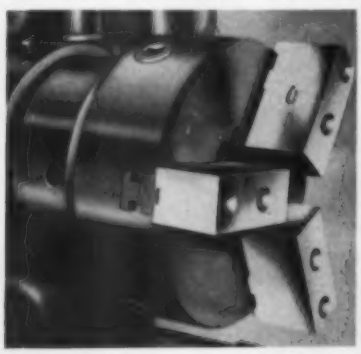
WEW 5844 B

Rotary Cutoff Machine Processes Up to 2000 Pieces per hr

Air-operated rotary cutoff machine is designed to handle pipes and tubes ranging in size from ⅜ to 1¼-in. OD and with wall thicknesses of up to 16 gage. Production is as high as 2000 pieces per hr. Operator feeds pipe or tube to preset stop, touches the air-valve foot switch and the rotary blade descends at desired cutting speed. Rotary cutting is said to be faster than other methods since its action is through the wall thickness rather than through entire diameter of material.

For intermittent use, a handle can be attached for manual operation. Adjustable pipe and tube support tables are available with nylon fork rollers to minimize scoring of material.

Continental Machine Co, 1952 N Maud Ave, Chicago 14, Ill

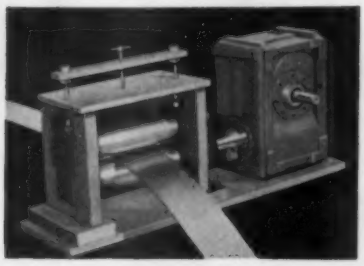


Standard Chuck Jaw Blanks Fit 300 Master Chucks

New line is being mass-produced in standard sizes to fit approximately 90% of all master chucks.

Precision machined to American Standard Form of SAE 1020 steel, these soft blanks can be formed to hold all types of irregularly shaped work. They can be machined to fit exacting holding requirements without marring work surfaces and with no need of special faceplates or fixtures.

Jergens Tool Specialty Co, 712 E 163rd St, Cleveland 10, Ohio



Ferguson High-Speed Roll Feeds Operate at Rates up to 1000 spm

Standard high-speed roll feeds are indexed with a roller gear drive to provide great repetitive accuracy at rates up to 1000 strokes per min. The cam indexing method features positive feeding action without frictional braking to eliminate a frequent source of inconsistent feeding. Rolls are connected by helical gearing and little or no slippage is encountered at production speeds.

Roller gear drive consists of a tool-steel cam with a tapered rib and a hub with ball- or roller-bearing followers. As cam rotates a curvature in the rib causes hub to move one increment, resulting in a partial revolution of the rolls to feed stock into the die.

Standard units are available with strokes from 1 in. or less to 10 in., and rolls up to 12 in. wide. Feed time of either 180° or 270° may be chosen with from 2 to 16 stops per revolution of rolls.

Ferguson Machine Corp of Indiana, Roller Gear Div, Box 5841, St Louis 21, Mo

Base-Mounted Jib Crane Available In Capacities up to 10,000 lb

Crane features a specially designed, heavy-duty beam support bearing which provides safe load support while requiring a minimum of maintenance. Construction is such that total beam deflection under full load does not exceed 0.060 in. per ft. Crane is available in 52 sizes ranging in capacity from 500 to 10,000 lb with boom lengths from 8 to 20 ft. Full 360° rotation is provided.

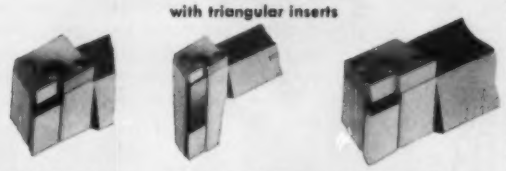
Becker Crane & Conveyor Co, 4900 Ridge Rd, Cleveland 9, Ohio

TEMPLET CAMERA will enable Convair Div of General Dynamics Corp to reproduce templets, ranging in size up to 5 x 12 ft, within 0.0005-in. accuracy by projecting the image of a drawing onto a sensitized plate of steel or aluminum, then machining or cutting the resultant pattern. Unit weighs over 10,000 lb, is 30 ft long and 8¾ ft high—*Robertson Photo-mechanix, Inc, 7440 W Lawrence Ave, Chicago 31, Ill*

V-R TOOLHOLDERS

. . . a complete line to meet your requirements

FOR STRAIGHT TURNING
with triangular inserts



Negative Rake Negative Rake Positive Rake

FOR 15° LEAD ANGLE TURNING AND PROFILING
with triangular inserts

Negative Rake Negative Rake Positive Rake

FOR 30° LEAD ANGLE TURNING AND PROFILING
with triangular inserts

Negative Rake Negative Rake Positive Rake

FOR 45° LEAD ANGLE TURNING AND PROFILING
with triangular inserts

Negative Rake Negative Rake Positive Rake

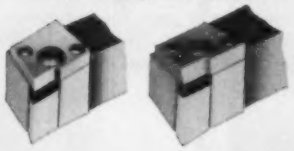
FOR STRAIGHT FACING
with triangular inserts

Negative Rake Negative Rake Positive Rake

FOR 15° LEAD ANGLE TURNING
with square inserts

Negative Rake Negative Rake Positive Rake

FOR OFFSET TURNING
with triangular inserts

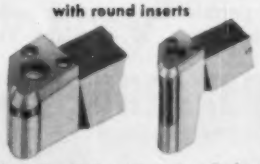


Negative Rake Positive Rake

FOR 15° LEAD ANGLE FACING
with square inserts

Negative Rake Negative Rake Positive Rake

FOR STRAIGHT TURNING AND PROFILING
with round inserts



Negative Rake Negative Rake

All V-R toolholders available in right and left hand styles. Right hand illustrated.

With V-R throw-away insert toolholders you eliminate carbide grinding. With V-R long head toolholders, you can use any insert up to 1½" length—and you regrind the insert until you have consumed up to 90% of its length. You reduce downtime because you change only the insert, not the tool, when a cutting edge is worn. Inserts are quickly and easily indexed or changed. There is nothing to fall out or fumble with.

Let your V-R qualified field service engineer show you the economies of tooling with V-R toolholders and inserts. Call him today, or write.

JUST OFF THE PRESS—
NEW TOOLHOLDER MANUAL

This completely new, comprehensive 52-page technical manual tells you how to select and apply V-R toolholders.

Send for your copy today.

MANUFACTURERS OF:
CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

TH-641

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

886 Market Street • Waukegan, Illinois

Toolmaker's Projector Features Illuminated Tolerance Lines

Designed for production or toolroom measuring operations, new instrument is portable and ruggedly built. The broad range of inspection jobs for which it may be used includes circular form and single-point tools; drill, tap and reamer inspection; screw machine parts; thread and gear tooth forms; and many similar operations.

Unlike many other optical instruments which use either a monocular eyepiece or ground-glass, this unit uses an opaque white 6 x 6-in. screen situated at rear of instrument hood. Magnified images (ranging from 10X to 100X) are projected on screen and are completely shielded from extraneous light and reflections.

Illuminated screen tolerance lines provide exceptional contrast and thus permit easier, more accurate measurements. A standard line of interchangeable screens is available. Measuring capacity is up to 6 in. in one setting. Two series of micrometer stages are provided— 1 x 2 in. and 1 x 6 in.—and these can be provided with either 0.0005 or 0.0001-in.-increment micrometers. Complete line of accessories is available.

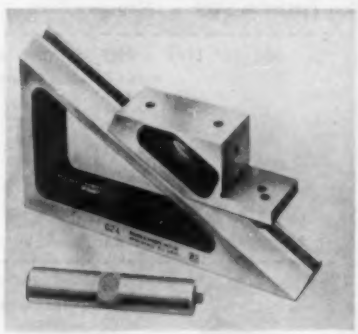
Stocker & Yale, Inc, Marblehead, Mass

Dixon Automatic Screwdriver Has Convenient Torque Adjustment

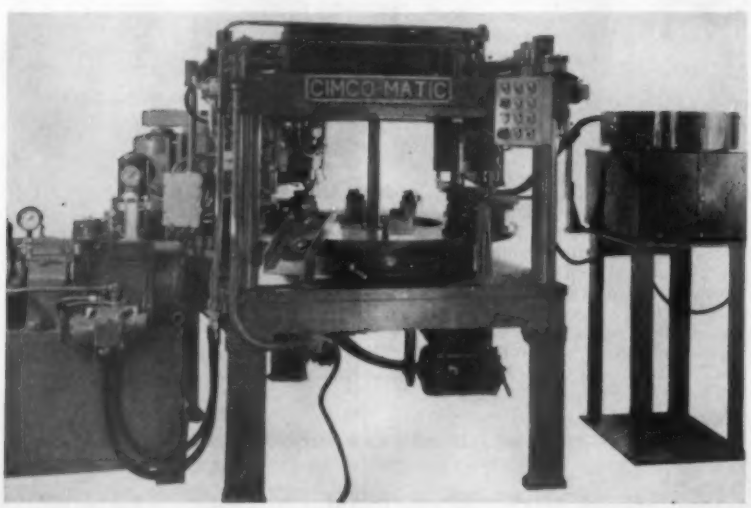
Auto-driver, Model SD-1, operating at 2000 rpm with a 3-in. stroke, can drive screws and nuts up to 5/16-in. size at speeds up to 60 per min. Operating on normal 80-psi airline pressure, machine features an air motor with easily adjusted torque range from 10 to 108 in.-lb, and an exclusive sensing system that stops machine if a screw or nut is not placed or properly torqued.

A graduated thumb-nut permits quick adjustment of torque to suit job requirements. Other features are similar to previously described standardized parts positioner (*AM*—May 6, '57, p176). Unit measures 21 in. high, 3 in. wide, and 5 in. deep.

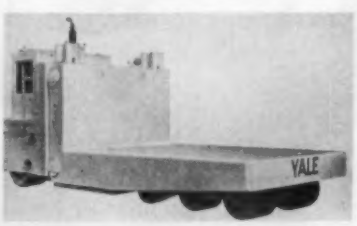
Dixon Automatic Tool, Inc, Rockford, Ill



TOOL SETTING GAGE, No. 624 Planer and Shaper Gage, has beveled ways which eliminate side-play and provide accurate alignment and parallelism between working surfaces. With an extension, gage has range from ¼ to 10 in. It has precision level and the platform has an extra tapped hole to accommodate a post for indicators and other accessories. — *Brown & Sharpe Mfg Co, Providence, RI*



SPECIAL ASSEMBLY MACHINE, Series 4C54, which assembles upper ball-joint assemblies for automobile steering gear features two spinning operations incorporated into a 10-step assembly sequence involving 8 different parts. Machine has hopper feed unit, automatic ejection, and can assemble 600 units per hr—*Cimco Engrg Co, Ann Arbor, Mich*



200,000-lb Capacity Lift Truck Designed to Handle Huge Dies

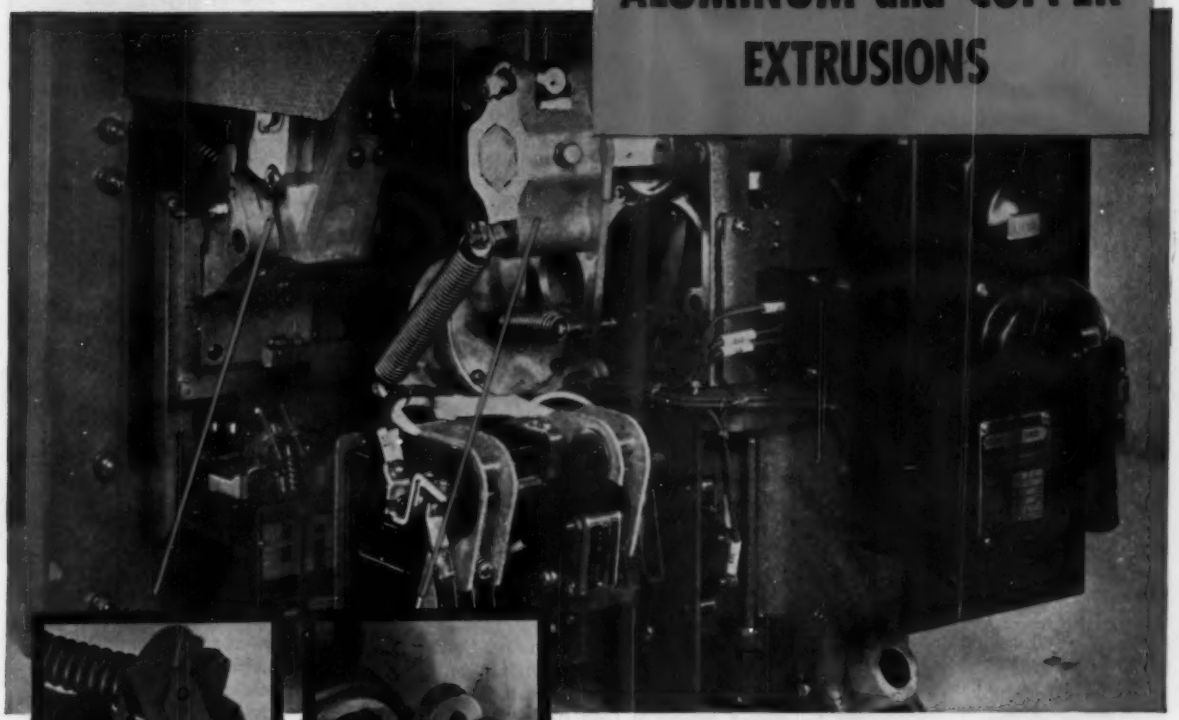
Diesel electric platform model is designed to provide 2 ft 4 in. of lift hydraulically.

Total weight is 77,000 lb; truck is 21 ft 4 in. long; die carrying platform is 13 x 8 ft. Unit, driven by four 36-in.-dia by 16-in. face drive wheels, steers hydraulically through eight sets of caster wheels.

Yale & Towne Manufacturing Co, Yale Materials Handling Div, 11,000 Roosevelt Blvd, Philadelphia 15, Penna

REVERE
ALUMINUM and COPPER EXTRUSIONS

I-T-E CIRCUIT BREAKER—KD (3,000 amp. rating) showing progressive assembly with Revere Copper and Aluminum Extrusions in place. I-T-E Circuit Breaker—KE is same type with 4,000 amp. rating.



COPPER
for conductivity

ALUMINUM
for economy

—form a Money-Saving team in latest

I-T-E CIRCUIT BREAKERS

Revere T. A. Service an Important Factor in Ultimate Design of Parts

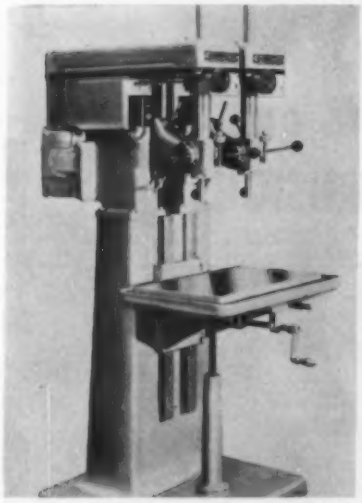
The larger of the two extruded and drawn copper shapes shown at extreme left started out on the drawing board as two pieces. It was thought that a single shape of this size could not be made satisfactorily. At this point, I-T-E Engineers got together with Revere's T. A. (Technical Advisory) Service and threshed things over. The final result is the one-piece extrusion shown and a reduction in machining time.

Aluminum was selected for the other extrusion shown because I-T-E found that it cost less per pound of metal and had a higher strength ratio when compared to a casting. Also, space was a factor. In all, Revere supplies 5 copper and 2 aluminum extrusions for KD and KE type I-T-E Circuit Breakers. All were designed to fit specific requirements of I-T-E Engineers. Where it could be used satisfactorily, aluminum was applied because of economy, while current carrying members called for copper.

This is still another example of Revere supplying the metal that will do the best job and with the greatest economy . . . be it aluminum, copper or any one of their alloys. So, with new things happening all the time in non-ferrous metals it can pay you to keep in close touch with Revere.

REVERE COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.



High-Speed Drilling Machine Features 10-in. Overhang

Designed for high-speed, sensitive drilling of small parts and assemblies, this new Model 1F machine is particularly adapted to higher production, longer runs, and larger work.

Featuring a 10-in. overhang, machine is available in standard or special-purpose combinations and in models of from one to six spindles, with speed ranges from 625 to 10,000 rpm. Positive control of speeds to match particular job is obtained by simply turning a knob conveniently located on the upper column. Exact spindle speed is shown in speed indicator window next to knob.

Prepositioned micrometer depth gage allows absolute control over penetration. Complete tension control ranges from a slow to a quick, springy spindle return. Unit is available in bench and pedestal models.

Edlund Machine Co, Cortland, NY

Preparation Processes for Electroplating Offer Maximum Adhesion

First two of a series of new preparation processes for electroplating offer a complete cycle for cleaning and preparing various metals to give maximum adhesion with various plated coatings.

First process, designated Enbond Z, for treatment of zinc-base die castings, utilizes an anodic electrocleaner and a companion acidic activator to produce a uniformly active surface ready for standard copper plating operations.

Second process, Enbond BR, is intended for preparation of brass and other copper alloys for any type of electrodeposit. Additional information available.

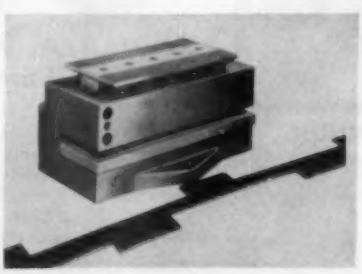
Enthone, Inc, 442 Elm St, New Haven, Conn

Hopper Feeder Orients and Feeds Small Metal and Plastic Parts

Model 110 Special drum hopper features a 10-in.-dia steel drum having a capacity of 100 cu in. Mounted on a double row ball-bearing drive shaft, drum is driven through enclosed spur gears by a high-torque gearhead motor.

Unit is supplied with brackets, buckets, and pan, requiring only chuting. Feeder can be quickly and easily tooled to feed headed fasteners, nuts, rivets, wire terminals, light electrical components, and other small metal and plastic parts at rates up to 150 pieces per min. Rubber lining is available if desired. Price, complete, is $195.

KDI Corp, 950 Exchange St, Rochester 8, NY

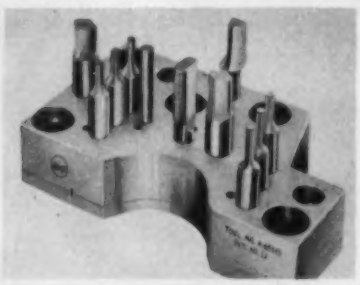


Edge-Notching Punches Feature Built-in Stripping Springs

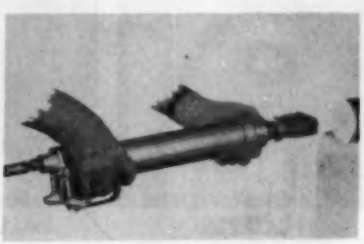
New line of Unipunch edge-notching units, Series A, with 8⅜-in. shut height and 3½-in. die height, are designed and built for setups on templets, T-slotted plates and rails in presses and press brakes. They can be set up to notch one, two or three edges of a sheet simultaneously in practically any required spacing or along the edge of angles for multiple notches with each stroke of press ram.

Units have built-in stripping springs and two pilot pins, and are available in 16 graduated sizes for notches from 1½ x 1 in. to 3 x 8 in. in material as heavy as ¼-in.-thick mild steel. Semi-standard notch sizes are also available. Catalog available.

Punch Products Corp, 3800 Highland Ave, Niagara Falls, NY



SPECIAL RETAINER PLATES for close mounting of interchangeable punches and die buttons incorporate a ball lock feature for quick insertion and release of each punch or die button. They can be mounted on standard dies in presses or brakes or used in progressive die designs. If certain holes are not desired, corresponding punches are simply removed. Literature available—*Acme Industrial Products, Inc, PO Box 468, Royal Oak, Mich



Pannier Adds Portable Pneumatic Tool to Metal-Marking Line

Single-impact pneumatic marker is a portable tool designed for hot or cold metal marking. Tool weighs only 12 lb, including head and type, and is easily carried about on the end of an air hose. It will operate on air pressure as low as 50 psi.

Interchangeable type-holders accommodate six 3/16-in. characters, four ¼-in. characters, or individual characters up to ½ in.

Pannier Corp, 104 Sandusky St, Pittsburgh 12, Penna

END MILLS ARE OUR BUSINESS . . .
NOT A SIDELINE

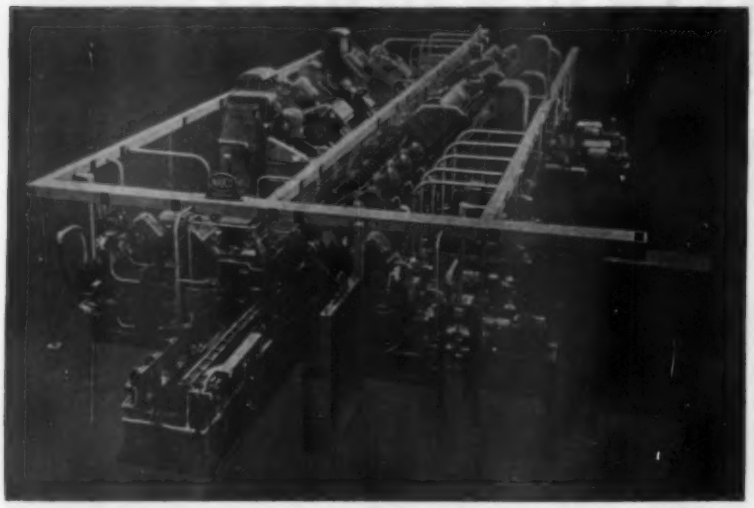
TO BEST SERVE YOUR NEEDS

For over twenty years our designing and manufacturing abilities have been devoted to producing highest quality end mills. Because end mills are our business, we realize that universal acceptance of our product is obtained and maintained by continuously supplying the best end mills available.

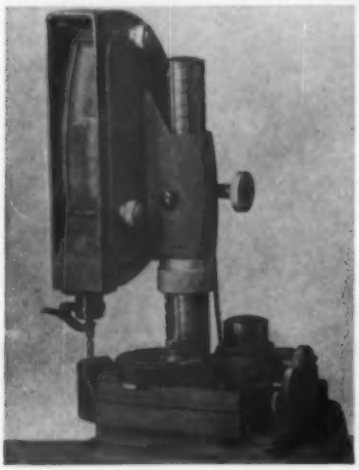
Putnam manufactures and stocks over 1400 standard types and sizes of end mills. Thus, you can quickly and economically select the exact size and type to best meet your needs.

Putnam Distributors from Coast-to-Coast carry large stocks of standard end mills. Contact your neighbor, the local Putnam Distributor, he will recommend the best end mill for specific jobs, give you personalized service, and quickly supply your needs with the finest end mills obtainable.

PUTNAM
TOOL COMPANY
2981 CHARLEVOIX AVENUE • DETROIT 7, MICHIGAN



CYLINDER BLOCKS are processed in 21-station Holeway transfer machine. Parts may be removed by dropping guide rail at stations which operate on one side only. Total of 56 drilling and reaming operations are accomplished as parts pass through stations—1 loading, 13 machining, 3 idle, 1 rotating, 1 inspection, 1 chip dumping and 1 unloading. Production rate is 120 blocks per hr—*National Automatic Tool Co, Inc, Richmond, Ind*



Leitz Offers an Inexpensive Internal Comparator Gage

Internal Tolerator Gage, product of Germany, is designed to offer maximum degree of flexibility both in range of diameter and depth of bore. ID measurements are made by the straight-line two-point-contact method. One measuring jaw is fixed and serves to locate work. Other jaw is a 1:1 bellcrank lever which is connected to gaging head. Table on which work is staged floats on balls and thus becomes self locating.

Gaging head is semi-optical device with a 1000:1 magnification; reading on illuminated screen is to 0.00005 in. Using only two sets of interchangeable jaws, bores between ¼ and 3½-in. diameter and up to ¾ in. deep may be gaged. Head can swing 180° to the rear over a standard anvil for regular external gaging of OD's up to 4 in.

Distributed by Opto-Metric Tools, Inc, 137 Varick St, New York 13, NY

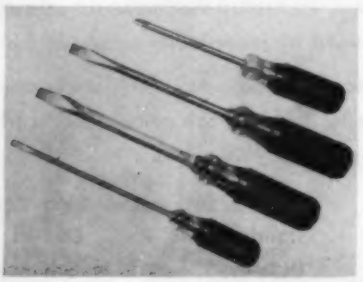
RIGHT-ANGLE GEARED WRENCH facilitates working around corners on jobs requiring tightening or loosening at normally hard-to-reach angles. Fits all standard extensions, sockets, and ratchets—*National Reechet Corp, 2093 E 19th St, Cleveland 15, Ohio*

Electronic Comparator Reduces Calibration and Inspection Cost

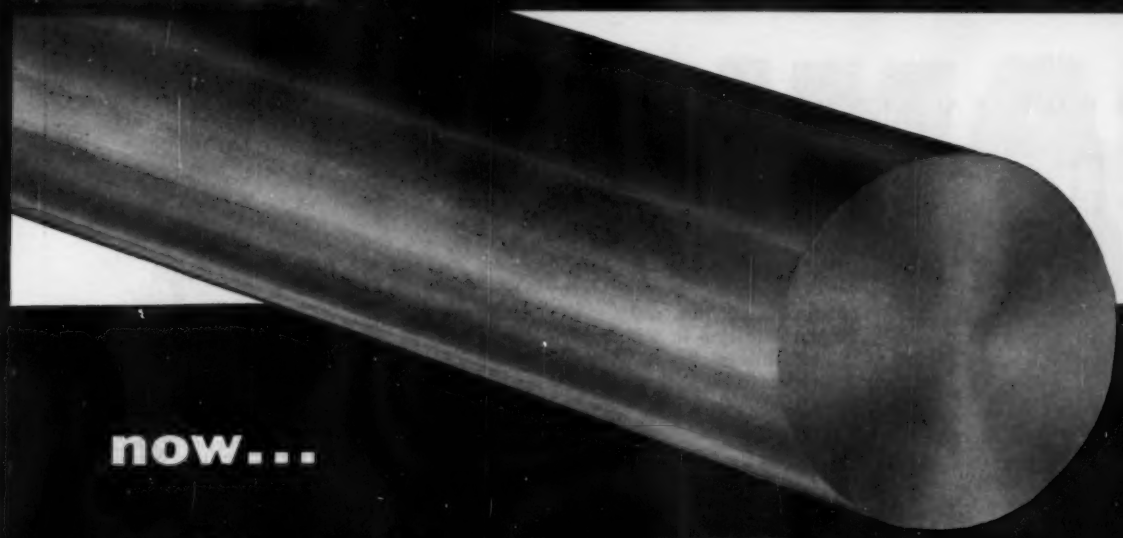
Micro-Ac electronic microcomparator, Model MA-1720, is recommended for use where maximum accuracy and reliability is required, such as gage block calibration, thread wire, servo pistons, and balls. Amplifier and gaging stand are designed for laboratory precision, yet are rugged enough for production use. Measurements to one-millionth are simple and can be made with a minimum of skill.

Gage head, amplifier, and stand make up complete unit. Dimensional changes at the gage tip are displayed on the meter magnified up to 100,000. In use, gage head is zeroed to the master dimension. Meter then shows variation from master dimension. Full line of accessories is available. Bulletin available.

Cleveland Instrument Co, 735-737 Carnegie Ave, Cleveland 15, Ohio



SCREWDRIVER, designated Cushion-Grip, features a neoprene rubber grip bonded to amberlite handle. Non-slip handle is unaffected by water, oil, and gasoline. It is said never to hurt hand and reportedly provides 50% greater torque than ordinary screwdrivers. Tool is available in variety of styles and in 16 sizes from 3 to 12 in. Prices range from $1 to $2.70—*Bridgeport Hardware Mfg Corp, Bridgeport, Conn*



now...

we've put COPPER into STRESSPROOF® steel bars

and the pennies you save add up to dollars!

New Copper Controlled Chemistry improves machinability, gives added wear resistance, and resists corrosion

Production increases by as much as 15% to 50% have been achieved in customer tests comparing STRESSPROOF with and without copper.

The controlled addition of copper to the STRESSPROOF chemistry improves machinability, gives added wear resistance, and resists corrosion. In addition, yield strength is guaranteed . . . 100,000 p.s.i. in sizes through 2" and 90,000 p.s.i. in sizes over 2"—*and* STRESSPROOF requires no heat treating.

JUST PUBLISHED: A new engineering report, "The Effect of Copper, Abnormally Heavy Drafts, Furnace Treatment and Die Practice on STRESSPROOF Steel Bars." Copies are available on request.

La Salle STEEL CO.

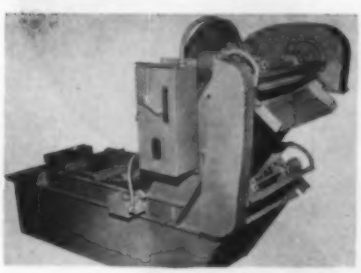
1416 150th Street, Hammond, Indiana

Vibratory Marking Machine Does Not Distort Delicate Parts

High-cycle, short-stroke, vibratory marking machine, known as the Vibro-Mark, was developed to mark part numbers on bucket and compressor vanes for jet engines. Light, vibratory strokes (approx 41 to 45 per sec) reduce the possibility of internal stresses in the material itself. Reportedly, this marking process does not distort the parts.

Machine, using hand fed fixtures, marks parts at rate of over 500 per hr. Equipped with automatic feed and timing devices, production is estimated to be over 700 parts per hr. Unit is composed principally of the same basic parts used in other Automark machines.

Defiance Machine & Tool Co, 1930 S Vandeventer Ave, St Louis 10, Mo



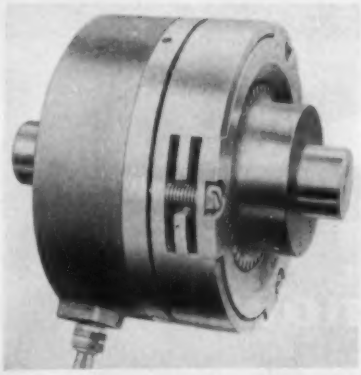
Filter Unit Combines Flotation, Progressive Filtering, Settling

Industrial liquid filtering system is an automatic, continuous, and self-cleaning unit incorporating all three principles of liquid clarification—flotation, progressive filtering, and settling. A horizontal self-cleaning slotted filter is used to increase efficiency without the use of accessory filters or materials. Unit is constructed with heavy-duty, oversized drive chains, conveyor chains, gear box, and sealed bearings to assure trouble-free low-maintenance service. Filter screens may be changed in 5 min.

Complete line of standard models is available in capacities from 20 to 1000 gpm and with filter screen sizes from 0.004 in.

Henry Mfg Co, Inc, Bowling Green, Ohio

ALL-NYLON FILTER, custom-molded to meet individual requirements, has proven effective in filtration of lube, diesel, hydraulic, and cutting oils—*Danielson Mfg Co, Industrial Products Div, Danielson, Conn*

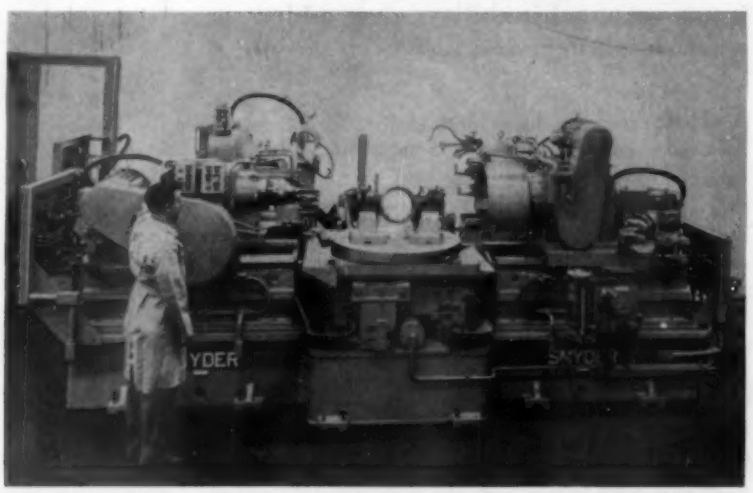


Electro-Magnetic Disk Clutches Feature Plug-in Connections

Model GS electric clutches are fast acting, give smooth engagement and disengagement, and can be actuated remote or direct with automatic or manual controls. Direct magnetic action completely eliminates mechanical yokes and shifters that can get out of order. Plug-in electrical connections do away with the slip rings or brushes usually found in rotating electrical equipment. Friction linings are easily adjusted to compensate for lining wear.

Units require dc supply and are available for operation with 12, 24, 90, or 115v dc. Clutches are easily adapted to modern machine tools and are available in sizes from 4 to 9-in. dia. Bulletin 503.

Stearns Electric Corp, 130 N Broadway, Milwaukee 2, Wis



TRACTOR DRIVE-AXLE HOUSINGS of three different types are machined on line-index type machine which performs 40 drilling, boring, turning, and tapping operations. Production rates range from 8.5 to 10.2 parts per day. Part-holding fixture and indexing table is indexed in a line to six stations between opposed wing-base machining units. Fixture can be rotated 180°. Machine is hydraulically operated and electrically controlled—*Snyder Tool & Eng'g Co, 3400 E Lafayette, Detroit 7, Mich*

CUSHMAN
POWER WRENCHES

speed production on single and multi-spindle machines

power wrench chucks designed specifically for use with power wrenches

CUSHMAN CHUCKS and CHUCK-ABILITY—
The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right workholding devices.

CUSHMAN the CHUCKMAN CHUCKS AND ACCESSORIES Exclusively SINCE 1862

CUSHMAN CHUCKS . . . a Product of American Quality, Labor and Materials. Sold Through Your Industrial Distributor.

THE CUSHMAN CHUCK COMPANY Hartford 2, Connecticut

Adapter Permits Wider Use of Form Relief Flat Step Drills

Form relief flat step drills can be used with this adapter on Brown & Sharpe automatic screw machines where clearances are too close to permit use of conventional holders. Adapter fits inside the tool opening of any floating or other type holder. Drill blades are positively locked yet quickly and easily changed without changing the setup. Bulletin available.

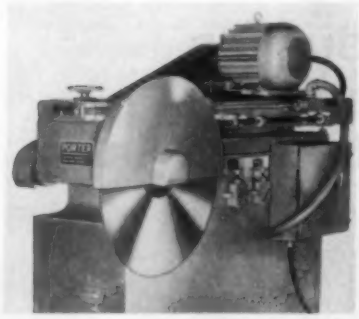
B & W Precision Products Co, PO Box 3865, Detroit 5, Mich

Mechanical Radial Positioner Speeds Drill Positioning

Mechanical device has been designed into Bux portable magnetic drillpress units that provides freedom to rotate the drill point a full 330° for accurate positioning after magnetic base has been turned on and is gripping the drill unit to the work.

A ¼ turn of the positioner locking handle frees the drill post for radial turning or for lateral movement to guarantee precision alignment for drilling, reaming, and tapping. Device is available on all models of Bux portable magnetic drillpress units at optional extra cost.

Buck Mfg Co, 1355 N 10th St, San Jose, Calif

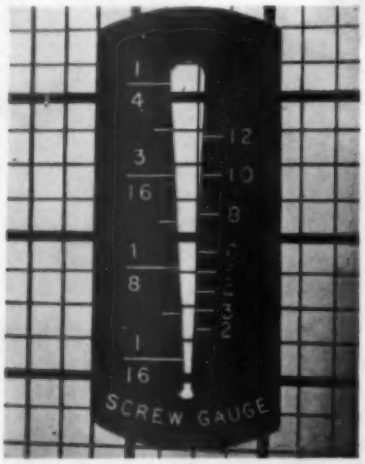


Porter Heavy-Duty Cutoff Saw Cuts Non-Ferrous Metals

Non-ferrous automatic cutoff saw, Model 45 Hydracut, is available in two stroke sizes, 24 and 36 in., and features a hydraulically operated carriage adjustable for cutting and return-feed speed variations of from 0 to 55 fpm.

Operator simply positions stock, presses an electrically operated foot pedal, and automated production is simply a case of efficient machine cycling.

C O Porter Machinery Co, 666 Front Ave NW, Grand Rapids, Mich



SCREW AND DIAMETER GAGE sizes wood and machine screws from 0 to 12, and diameters from 1/16 to ¼ in. Gage, featuring easy-to-read graduations, is free when requested on company letterhead—*Dayton Rodgers Mfg Co, 2824 13th Ave S, Minneapolis 7, Minn*

Motorized Grinding Head Attaches To Boring and Milling Machines

Self-contained motorized vertical-spindle grinding head, a British product, can be attached to planers, boring and milling machines, and heavy-duty lathes. Spring-loaded handwheel adjusts the motor rotor to give a fine adjustment for depth of cut. Unit develops 1 hp at 3000 rpm, and is fitted with an 8-in.-dia cup-type grinding wheel. Higher-powered units up to 4 hp and other wheels are available.

Distributed by Air Transport Equipment, Inc, Amityville, LI, NY

Pin-Mount 3-Flute Core Drills Available in Small Sizes

New line of Metcut drills is available from stock in 21 small sizes from ¾ to 1⅜. Tool consists of drill body and high-speed or carbide-tipped replaceable cutter secured by Allen head capscrew.

Tips are accurately positioned on a ground boss and driven by three pins, one in the center of each flute. Use of driving pins makes it possible to provide these tools in small sizes and maintain deep flutes with adequate chip space for easy disposal. Cutter can be easily removed from holder without taking tool from spindle.

Metal Cutting Tools, Inc, 301 S Water St, Rockford, Ill

VANADIUM-ALLOYS STEEL COMPANY

steels that translate quality into performance

DIE STEELS FOR cold work

Your assurance of providing the finest quality Cold Work Die Steels for your shop is integral in every pound of our products. Vanadium-Alloys Die Steels feature uniformity of quality unvarying from one shipment to another—uniform in structure, uniform in response to heat treatment, uniformly free from defects so that your expensive dies are free from trouble. • You can cover the maximum number of die applications with these three favorite steels. Keep them on hand in the sizes your jobs require—and let Vanadium-Alloys quality do the rest!

Ohio Die

Lowest movement in hardening. High in strength and toughness. Outwears low alloy steels five to eight times. Air or oil hardening. Available in FM (free-machining) type also. Stocked in all warehouses.

Air Hard

General purpose, deep hardening, exceptional strength and toughness. Hardens in still air to Rockwell 65, with much lower movement than manganese types. Also available in FM (free-machining) type. Available from stock in all warehouses.

Colonial No. 6

The best cold work die steel for general toolroom purposes—tops in versatility. Manganese oil hardening, specially annealed for easy machining. Stocked in all warehouses.

VANADIUM-ALLOYS STEEL COMPANY

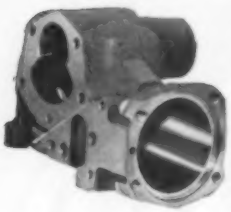
LATROBE, PENNSYLVANIA

SUBSIDIARIES: Colonial Steel Co. • Anchor Drawn Steel Co. • Pittsburgh Tool Steel Wire Co. • Vanadium-Alloys Steel Canada Limited • Vanadium-Alloys Steel Societa Italiana Per Azioni • EUROPEAN ASSOCIATES: Societe Commentryenne Des Aciers Fins Vanadium-Alloys (France) • Nazionale Cogne Societa Italiana (Italy)

Why MICROHONING

Is Final Stock Removal Process For Interrupted and Blind-End Bores

To secure low-cost, final stock removal, that generates accuracy and functional surface characteristics in a variety of bore conditions, a leading manufacturer of power steering assemblies uses Microhoning. Here are details concerning types of bores and stock removal results obtained by using Micromatic "Know How"—



STEERING GEAR HOUSING—Microhoning consistently corrects cumulative inaccuracies of preceding operations—reduces scrap—permits faster boring—cuts boring tool sharpenings—lowers down-time and tool costs.

Material: Soft Malleable Iron
Bore: 3.125"D x 6.93"L (Ported bore with ¼" relief at blind end)
Stock Removal: .002"
Finish: 50 Microinches RMS
Microhoning Cycle: 18 sec.
Preceding Operation: Boring

PISTON RACK—Microhoning answers the need for a final stock removal process that generates a controlled surface finish in the bore of this leaded steel part. Microhoned surface (cross hatch) prevents oil leakage and holds to a minimum the wear of seal that operates in the bore.

Material: Leaded Steel (Rockwell 62 "C")
Bore: .875"D x 3"L
Stock Removal: .005"
Finish: 20 Microinches RMS
Microhoning Cycle: 20 sec.
Preceding Operation: Boring and H.T.

VALVE HOUSING—Microhoning consistently holds size and geometric accuracy—meets stringent surface requirements—assures alignment of four lands in bore. Thus, there is no leakage of oil around control valve which is selectively fitted to its housing.

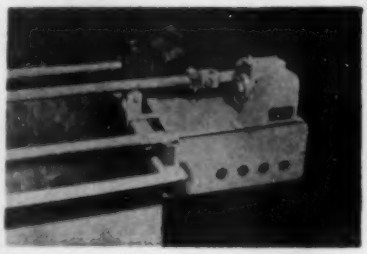
Material: Cast Iron
Bore: .770"D x 2.18"L (Interrupted)
Stock Removal: .0025"
Tolerances: Size .0005"
Roundness .0001"
Straightness .0001"
Finish: 10 Microinches RMS
Microhoning Cycle: 12 sec.
Preceding Operation: Boring

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision" . . . available at your request.

☐ Please send me "Progress in Precision" in time for showing on _____ (date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME _____ G
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN



CATHODE ROD AGITATORS clamp on electroplating tank and eliminate need for stands or brackets. Available in single- (illustrated) or double-rod models, agitators are said to double tank capacity, permit plating at higher currents, prevent burning, throw off gas bubbles, and give brighter deposits. Bulletin available—*Randall Mfg Co, Inc, 1373 Lafayette Ave, New York 59, NY*

Inspection equipment, made of lightweight magnesium and aluminum, includes universal angle plates, height blocks, patternmakers' angle plates, tooling angles, straightedges, and parallel straightedges. These hand-scraped units are accurate to within 0.0002 in. TIR. Literature available.
Challenge Machinery Co, Grand Haven, Mich

Face shield windows for company's H series shields are available with evaporated aluminized coating. Also available is an aluminized plastic cover plate for welding helmets. Both reflect more than 70% of radiant heat normally reaching worker's face. Bulletin S-6310.
American Optical Co, Safety Products Div, Southbridge, Mass

Plastic covers are now available for company's line of centerless lapping machines. Covers are included in price of new machines and may also be purchased for machines now in use. Made of polystyrene and finished with a heavy steel band, hoods are reported to protect machines against dust and dirt, and against accidental dropping of hand tools.
Size Control Co, Div of American Gage and Machine Co, 2500 W Washington Blvd, Chicago 12, Ill

Ultrasonic transducer, Model UT-2-42, is sealed in stainless steel housing and is completely immersible in organic solvents, mild alkalis and acids, and normal detergent solutions. It uses Glennite piezo-electric ceram-

ics and is designed to give a non-focusing and uniform field over large areas for cleaning, degreasing, and processing applications.

Gulton Industries, Inc, 212 Durham Ave, Metuchen, NJ

Dual-range flowmeters, 1600 Series, are designed for inert-gas welding, flushing molten metals, laboratory service, and other industrial applications where accurate control and constant visual check of flow rate are required.

Air Reduction Sales Co, 150 E 42 St, New York 17, NY

Pneumatic timing relay, measuring only 2½ in. wide by 7⅝ in. high, meets restricted space requirements of machine tool control panels. It offers adjustable timing range of 0.2 sec to 3 min with an accuracy of ±10%. Models available for ac and dc current.

Square D Co, 4041 N Richards St, Milwaukee 12, Wis

Self-adhering numbers, letters, and signs for every industrial marking application are available in many bold color combinations. They are offered in cloth, vinyl, or any self-adhering material specified. Catalog and samples available.

Western Lithograph Co, Westline Products Div, 600 E 2nd St, Los Angeles 54, Calif

Foot Guard, for use with all Versa pedal-actuated control valves, prevents accidental tripping and protects operator and actuating device. It can be used bolted down or unbolted. Bulletin 657 available.

Versa Products Co, Inc, 249 Scholes St, Brooklyn 6, NY

Automatic counters, Tally-King line, are available in six models. No. TK-4, available in either ratchet or revolution design, incorporates a mechanism that causes it to stop automatically if an error occurs. This model counts up to 99,999 at speeds up to 2000 counts per minute; others produce total counts from 9999 down to 99.

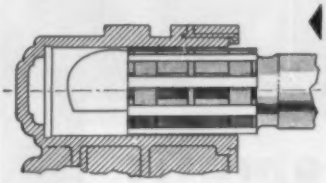
Bankers & Merchants, Inc, 3227 N Sheffield Ave, Chicago 13, Ill

Portable bucket pump, called Big A, pumps either oil or grease in any weather at pressures of 2500 to 5000 lb. Lubricant capacity is 35 lb. Available in seven models for all types of lube fittings, unit is equipped with

How MICROHONING

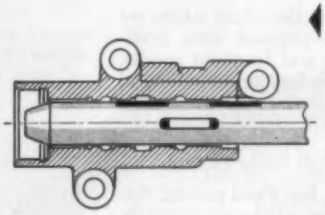
Cuts Costs—Generates Accuracy—Speeds Production of Interrupted, Blind-End Bores

Shown are two Microhoning machines that are used in the plant of a leading manufacturer of automotive power steering assemblies. Machines are equipped with automatic stone feed and stonewear compensating mechanisms, and automatic sizing controls. A two-position rotary fixture is interlocked with machine controls for fully automatic index cycle. The following applications tell more of the "how".



STEERING GEAR HOUSING—In Microhoning the ported, blind-end bore of steering gear housing a nine-stone tool is used. At least six of nine stones are in contact with bore surface when tool passes over irregularly shaped port. Removing .002" of stock from 3.125"D x 6.93"L bore in 18 seconds, Microhoning generates final accuracies and a controlled finish of 50 microinches as specified.

PISTON RACK—In 20 seconds, Microhoning removes .005" of stock from .875"D x 3"L open end leaded steel bore of piston rack. Self-sharpening abrasives assure a consistent generation of specified surface finish of 20 microinches.



VALVE HOUSING—Microhoning tool used for final stock removal in bore of valve housing has one bank of stones and two banks of plastic guides—three stones or guides in each bank. Guides act as tool pilots and stabilizers in interrupted bore—prevent overcutting at edges of lands—assure straight bore by keeping tool aligned. Self-dressing abrasives consistently generate geometric accuracy of .0001" and surface finish of 10 microinches.

Microhoning economically removes stock—corrects cumulative inaccuracies of preceding operations—reduces scrap—permits faster boring—lowers machine tool downtime and maintenance to cut costs and speed production.

Send Coupon for Complete Information

Learn how Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME _____ G

TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

"Work flows through our machines at an unbroken pace—

with **LIPE Automatic**

MAGAZINE LOADING BAR FEEDS"

says Factory Superintendent Dan Thomas*

Our production figures ran all over the chart when we were using stock-feeding devices equipped with feed-fingers. In addition to tricky set-ups and frequent re-sets, we lost a lot of polished stock which had to be scrapped or refinished when scratched or marred by feed-fingers. Operators suffered fatigue and strain trying to stay on top of these mechanical "prima donnas." Production suffered from the slow-downs resulting from all these factors.

Our first test run of a Lipe A.M.L. Bar Feed proved that every one of these "bugs" could be eliminated—permanently. It fed stock continuously . . . without feed-fingers . . . with no repeat motion for feed-outs . . . no down-time for adjustments or remnant removal. There was no cutting air: From 7:30 to 4:00 every turn of the spindles produced *work* . . . at a day-in-day-out delivery of 58% higher production! Our entire department is now equipped with Lipe A.M.L. Bar Feeds.

WRITE or WIRE for a FREE Lipe Sales Engineering estimate of production increases, savings and amortization time of Lipe A.M.L. Bar Feeds in your production layout.

*Photographer's models and pseudonyms used to protect company identity and confidential information.

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N.Y.

BAR FEEDS • HEAVY-DUTY AUTOMOTIVE CLUTCHES • PORTABLE POWER HACK SAWS

NEW SHOP EQUIPMENT

gasket-sealed cover and a new foot valve to assure full pressure at every stroke.

Stewart-Warner Corp, Alemite Div, 1826 Diversey Pkwy, Chicago 14, Ill

VARIABLE SPEED DRIVE, designated Zero-Max (AM—May 6 '57, p 180) is now available in a reversing model. Shaft rotation reversal is achieved without reversing motor. Unit is available in models delivering 10, 15, and 20-in.-lb torque. Speeds are infinitely adjustable from 0 to 400 rpm. Prices start at $80—*Revco, Inc, 1900 Lyndale Ave S, Minneapolis 5, Minn*

Bondable Teflon is the product of a process which alters the surface of the Teflon to make possible permanent bonding to a variety of materials with conventional adhesives. Good bond strengths have been obtained on aluminum, mild steel, plastic, wood, and other rigid materials.

Abbott & Biddle, 2417-X58 Federal St, Philadelphia 1, Penna

Chemical resistant coating, Rubber-Coat Liquid Hypalon, is extremely inert to almost any type of chemical attack and comes in white and bright colors so as to be easily identifiable on various pieces of equipment. Material is easily applied by brush or spray and is effective over the range from −40 to +350 F.

Wilbur & Williams Co, 130 Lincoln St, Boston 35, Mass

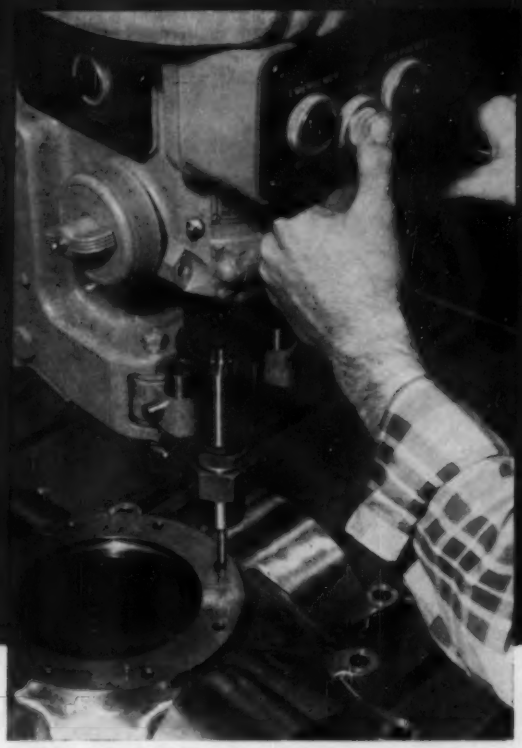
Plastic pallets, skids, trays are designed to meet rugged operating conditions. Units are lightweight—a 40 x 48-in. pallet weighs 23 lb. They will not warp, crack, or sag, and are not affected by extremes in weather.

Paltier Corp, 1701 Kentucky St, Michigan City, Ind

Flexible shafts are available in six models; three designed for power drive, and three for remote control applications. Remote control models

Another Bath Tap job well done . . . for UNITED AIRCRAFT CORPORATION

HAMILTON STANDARD DIVISION



Specially designed Bath Tap is shown threading four-way barrel of steel that forms hub of four-bladed Hamilton Standard propeller, Model 34G60.

PROBLEM

Two passes were required to produce ⅜"-24NF3 bottoming holes ⅝" deep in Hamilton Standard steel propeller hubs—one pass for machine-driven roughing tap and one pass for hand-driven finishing tap.

SOLUTION

One Bath Tap now does the entire job by machine—faster and better . . . in a single pass.

Model 34G60 four-bladed Hamilton Standard propeller, installed on Air Force tanker plane

Bath engineers and craftsmen helped solve this tapping problem for Hamilton Standard and helped to improve the efficient production of an important component. This same sort of service is yours for the asking!

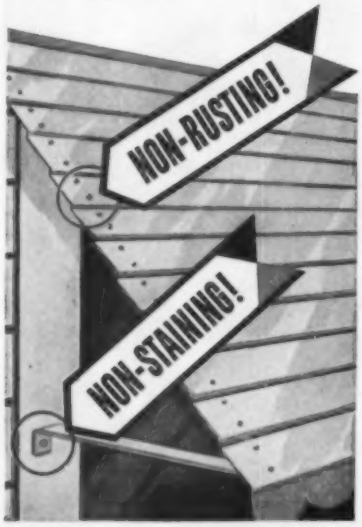
In addition to the design and manufacture of special custom-built taps, Bath has a full line of regular taps and precision gages in standard types and sizes. A request on your business letterhead will bring full information.

JOHN BATH & CO., Inc.

22 Mann St., Worcester, Mass.

CYLINDRICAL AND THREAD GAGES • GROUND THREAD TAPS
INTERNAL MICROMETERS

How Alcoa Aluminum Fasteners make good awnings even better



Alcoa® Aluminum Fasteners guard your reputation for quality aluminum awnings. They insure against both galvanic and atmospheric corrosion. They provide perfect color match and lasting good looks. Specify Alcoa Fasteners for assembly and installation. Your local Alcoa distributor carries complete stocks for every requirement. He is listed in the Yellow Pages of your telephone directory.

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

ALCOA ALUMINUM FASTENERS

Your Guide to the Best in Aluminum Value

Fill out coupon for facts, samples

Aluminum Company of America
2238-J Alcoa Bldg., Pittsburgh 19, Pa.

Gentlemen:
Please send complete specification data and samples of Alcoa Aluminum Fasteners.

Name_____

Title_____

Company_____

Address_____

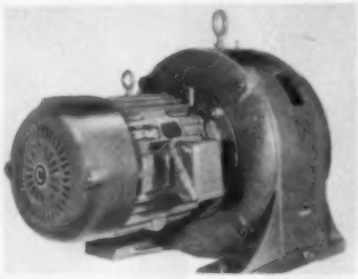
NEW SHOP EQUIPMENT

handle torques ranging from 1/6 in.-lb to 50 in.-lb. Shafts are stocked in 3-ft lengths and come equipped with female couplings at each end.

S S White Industrial Div, 10 E 40 St, New York 16, NY

Heavy-duty stepladder is made of aluminum alloy. Front and back steps are staggered to provide safe support for staging between two ladders. Ladder will support 800 lb, and is available in 4-ft through 20-ft lengths.

Metallic Ladder Mfg Corp, Randolph, NY



GEARMOTORS are available with polyphase, single phase, and dc motors; single, double, and triple reduction with output speeds from 750 to 7.5 rpm; double and triple reduction units from 350 to 7.5 rpm—*Century Electric Co, 1806 Pine St, St Louis 3, Mo*

High-strength molded nylon screws are said to be ideal for applications where closely held tolerances are important. Initial sizes for machine screws are 6-32, 8-32, and 10-32, in lengths from ⅜ to 1 in. Headless setscrews up to 5/16-in. OD and 13/32 in. long are also available. Threads are class 2, unified standard. Screws are produced in fully automatic molding machine, using single-cavity techniques.

Gries Reproducer Corp, 400 Beechwood Ave, New Rochelle, NY

Swivel-clamp magnifier attaches to workbench, lamp, or machine tool. Device has a 4-in.dia, +5 diopter lens; lens has 8-in. focal length. Price is $4 postpaid.

Edmund Scientific Co, Barrington, NJ

Pin-point oiler is designed like a fountain pen and delivers oil in quantities as small as a fraction of a drop. Unit operates in holes up to ⅞ in. deep and other difficult-to-reach spots. Spring-controlled steel point is pressed against spot to be oiled, then released; fraction of a drop is ejected. Oil supply is always visible.

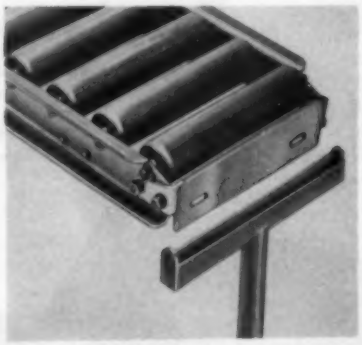
Dill Mfg Co, 700 E 82 St, Cleveland, Ohio

Guide-bar support arm and guide bar on the Keller power hacksaws have been redesigned to give greater rigidity. This permits more pressure to be applied to saw blade, thus reducing cutting time. Improvement has been incorporated into following models: 3B Dry Cut, 3C Wet Cut, 3CH Wet Cut, 4 Hy-Duty, and 5 Hy-Duty.

Sales Service Machine Tool Co, 2363 University Ave, St Paul, Minn

Air-hose nozzle holder, called the Dilley Magnetic, consists of a pliable rubber nozzle fastened to Alnico magnets. Slight, one-finger pressure starts flow of air through nozzle; air is shut off as pressure is released. Device attaches to machine tools at point of use. It can be adapted to positioning of coolant hoses and paint spray nozzles.

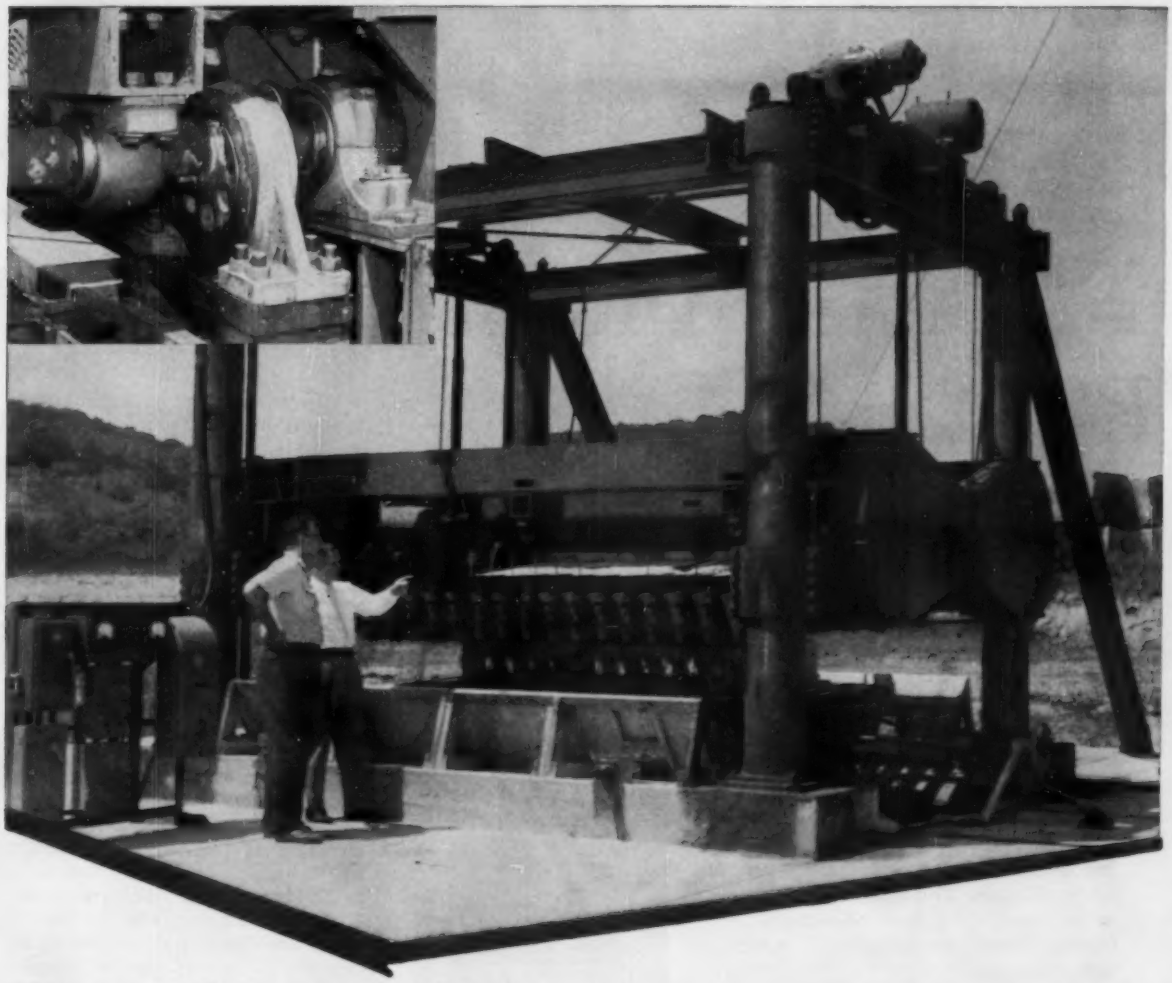
Dilley Mfg Co, 1655 Doan Ave, Cleveland, Ohio



CONVEYOR COUPLING, called Quick-Eez, eliminates hooks and rods and other standard joining methods. End plates of conveyor sections fit into slotted tops of tubular stands. Stands are available for straight or curved sections and in four sizes to provide adjustable heights from 12 to 48 in.—*E W Buschman Co, Clifton and Spring Grove Aves, Cincinnati 32, Ohio*

Powdered chromate coating designated Kenvert 18, for producing iridescent films on zinc, cadmium, copper, brass, and zinc die castings, may be adjusted to give varying bronze shades by varying pH, concentration, and immersion time.

Conversion Chemical Corp, Rockville, Conn



Bearings, Inc. helps engineer first change in stone sawing since the year 1.

It took over 1957 years to bring about a basic change in stone saws! A Bearings, Inc. service engineer helped this customer, a stone company in Central Ohio, make this change for more accurate, high-speed stone sawing. Previously, stone "sawing" had actually been a process of grinding stone away with the help of abrasives.

Now, an eccentric bearing (shown above) specially designed by our engineers accurately controls movement of the blades into the work and with the use of carboloy tools on the blades, *stone is now actually cut for the first time.* No abrasives are required and cutting speeds are many times faster than with the old method.

You may not have a stone cutting problem but if your problem involves bearings . . . get the competent services of bearing experts who sell and service the best nationally known lines of bearings and accessories. Call the stock carrying branch nearest you now!

Providing bearing service in the territories adjacent to our branches, listed below.

BEARINGS, INC.

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute
PENNSYLVANIA: Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Parkersburg • Wheeling
NEW JERSEY: Camden • **MARYLAND:** Baltimore
DELAWARE: Wilmington •
Subsidiaries: Balanrol Corp. • Buffalo, N.Y.•
In the South • Dixie Bearings, Inc.

37,440

Precision Pieces per 8 Hour Day!

PROBLEM:

One of America's leading electrical manufacturers needed thousands of mounting brackets daily for interchangeable line switches. Material — .050" cold rolled steel . . . close tolerances . . . interchangeable uniformity . . . production economy!

SOLUTION:

B. Jahn delivered — "PRODUCTION PROVED" 8 station progressive die to perform marking, piercing, blanking, forming and cutoff in one press operation. 106 ton press produced 78 pieces per minute — 37,440 pieces per day! Another unusual die problem, routine at B. Jahn!

Progressive Dies • Tools • Jigs • Gages • Jig Boring • Keller Duplicating
"Production Proved" Dies • Special Machinery • Jig Grinding • Fixtures

Send for Colorful 20 page "CASE HISTORY" Brochure TODAY!

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

Round Table . . .

QUICK STUDY . . . OR TRY-AND-SUCCEED?

Is a foreman the best judge in sizing up and placing a job applicant in his own department? Or is Personnel better equipped to gage the abilities and experience of the worker?

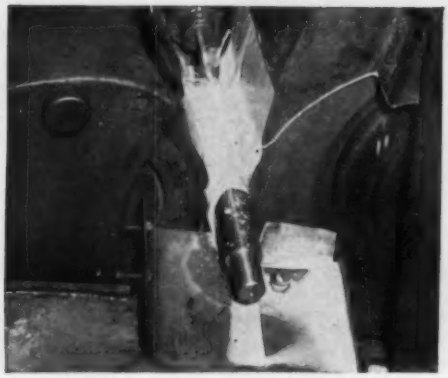
IN THIS MODERN age of technological advances in manufacturing, the hiring, placement, and training of employees should be on a comparable scientific basis. A foreman's opinion of a new man is no longer the best method of judging him, nor should training be a one-man affair. Centralized, organized training methods are necessary to meet today's employment needs.

In addition to formal, long-term machinist and tool and diemaker apprenticeships, many organizations and individual companies have developed short-term "learner" programs tailored to the needs of their particular industries. These are designed to provide quick basic instruction in the particular job for which a man is hired and also serve to screen out inept new employees. These training programs are usually under the direction of a training supervisor in the personnel department who has had vocational counseling training.

The short-term training program is planned to make a productive worker out of a new employee in the shortest possible time. It works this way —a drillpress learner, for example, spends each morning of his first week in an in-plant classroom, and the afternoon in his own department in on-the-job training. His classroom work covers blueprint reading, use of measuring instruments and gages, and learning decimal equivalents. If at the end of the week, the new employee proves unsatisfactory he receives further special training, transfers to another department, or is separated from the company. This is a practical way to make a productive worker out of a new employee in the shortest possible time, and to screen out the inept.

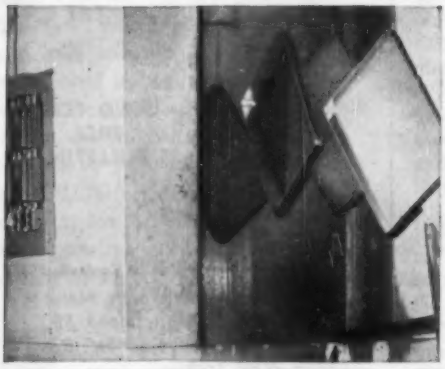
The foreman should welcome any plan that will lighten his burden. He should realize that the vocational guidance expert is in a better position to size up a prospective employee than the harassed foreman

CUTTING



GRINDING

ROLLING



WASHING

HOW SUNOCO EMULSIFYING OILS HELP YOU CUT COSTS

The S.E.C.O. series will meet all your emulsifying oil needs

REGULAR • Sunoco® Emulsifying Cutting Oil (S.E.C.O.) is a low-cost general-purpose oil for most cutting and grinding applications. Operators like S.E.C.O.—it makes clean emulsions that stand the gaff of long production runs. Its superior rustproofing ability protects both machines and work.

HEAVY-DUTY • S.E.C.O. HD emulsions have film strengths more than twice those of regular emulsifying oils. This extra strength, plus high oiliness, gives you a low-cost way to machine today's tough alloys and "hot" jobs.

SPECIAL • Custom grades of Sunoco Emulsifying Cutting Oil are made to meet unusual hard-water conditions. Other special formulations are used in rolling steel, brass, aluminum . . . in hot and cold washing . . . in rustproofing . . . and in many other applications.

FOR FULL INFORMATION: Call your Sun representative or write for Technical Bulletin 16 (S.E.C.O.) and Technical Bulletin 11 (S.E.C.O. HD). Write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-9

Industry uses more Sunoco Emulsifying Oil than any other emulsifying oil.

SUNOCO

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILA. 3, PA.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

© SUN OIL CO., 1957

The tiny steel balls shown in the race ways of the

under pressure to meet his work schedules.

Centralized and organized hiring and training under the administration of qualified vocational guidance counselors and instructors will be helpful in dragging hiring and training out of the hit-or-miss, "horse and buggy" stage of employment placement into the light of modern practices. Technological progress has created new and highly skilled crafts, and added so many new skills to old crafts as to alter them greatly. Closer tolerances, finer finishes, more intricate design, and the use of finer equipment and materials are making it necessary to adopt a more scientific approach to hiring, placement and training of the worker. Traditional views on hiring, placement, and training must be discarded and an entirely new look must be taken.

A comparison of the old method of hiring and training and the newer method will clearly indicate the desirability of modern practice. Up-to-date hiring and training methods make it easier to weed out the unsuitable and inefficient and start the good prospects on the right road, than the foreman-operated system of hiring and training. Short-term centralized training plans quickly get the new man started on the methods of the particular shop that he is slated for. They give him fast, basic instruction in the particular job for which he is hired. And if he needs special training, that can also be arranged.

One company I know of uses the following short-term "learner" plan. Its training plan for new employees lasts two weeks, with four hours each day spent in the classroom, the balance in the shop. Classroom training is divided into 20 hours of blueprint reading, 10 hours of precision measurement practice and 10 hours of miscellaneous instruction. Special films are used in teaching blueprint reading and measurement principles.

Another short-term "learner" plan used by industry takes anywhere from two days to two weeks, depending on the man and the nature of his job. Here, all the work is done in a training room equipped with lathes, turret lathes, drills, grinding and milling machines. New employees go directly into the training room, which is staffed with qualified instructors and a vocational guidance counselor. As soon as the instructors and counselor consider a man sufficiently trained to fill a particular job, he is transferred to that department. For those new employees who do not measure up, the instructors, together with the vocational counselor, determine if the man should receive further special training or let out. These employment specialists are the better judges of a man's abilities and capabilities than the shop foreman. Regarding personality factors in the new man that would make working together impossible, I believe that the skilled vocational specialist can quickly spot the undesirable and weed him out at the start.

Harry Kaufman
Philadelphia, Penna

"I saw the doctor yesterday. He says I'm suffering from a disease called inertia."

GOOD BYE MR MECHANIC!

Do some shop men tend to hold white-collar jobs in too high esteem? Is there a feeling that transfer to such a job will mean quicker promotions, more opportunities to advance in pay and prestige?

The value of a reward is variable with different men. While one person may feel achievement when he has attained a certain paycheck, another may consider this of minor importance unless he has certain surroundings which mean more to him.

No doubt a good mechanic would make more money in a shop than he would as a junior draftsman at a drawing board. However, he might be a person who is happiest when, during a coffee break, or on a lunch hour, he can make mention of a concert he's been to or an art show he's seen. Generally, laboring men frown on such topics of conversation. This being the case, a fellow with a taste for such things

MEEHANITE CASTINGS ARE MADE ONLY BY MEEHANITE FOUNDRIES

The American Laundry Machinery Co., Rochester, N. Y.
Atlas Foundry Co., Detroit, Mich.
Banner Iron Works, St. Louis, Mo.
Barnett Foundry & Machine Co., Irvington, N. J.
Blackmer Pump Co., Grand Rapids, Mich.
Centrifugally Cast Products Div., The Shenango Furnace Co., Dover, Ohio
Compton Foundry, Compton, Calif.
Continental Gin Co., Birmingham, Ala.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio and Grove City, Pa.
Crawford & Doherty Foundry Co., Portland, Ore.
Empire Pattern & Foundry Co., Tulsa, Okla.
Florence Pipe Foundry & Machine Co., Florence, N. J.
Fulton Foundry & Machines Co., Inc., Cleveland, Ohio
General Foundry & Mfg. Co., Flint, Mich.
Georgia Iron Works, Augusta, Ga.
Greenlee Foundry Co., Chicago, Ill.
The Hamilton Foundry & Machine Co., Hamilton, Ohio
Hardinge Company, Inc., New York, N. Y.
Hardinge Manufacturing Co., York, Pa.
Johnstone Foundries, Inc., Grove City, Pa.
Kanawha Manufacturing Co., Charleston, W. Va.
Koehring Co., Milwaukee, Wis.
Lincoln Foundry Corp., Los Angeles, Calif.
Nordberg Mfg. Co., Milwaukee, Wis., St. Louis, Mo.
Palmyra Foundry Co., Inc., Palmyra, N. J.
The Henry Perkins Co., Bridgewater, Mass.
Pohlman Foundry Co., Inc., Buffalo, N. Y.
The Prescott Co., Menominee, Michigan
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Sonith Industries, Inc., Indianapolis, Ind.
Standard Foundry Co., Worcester, Mass.
The Stearns-Roger Mfg. Co., Denver, Colo.
Valley Iron Works, Inc., St. Paul, Minn.
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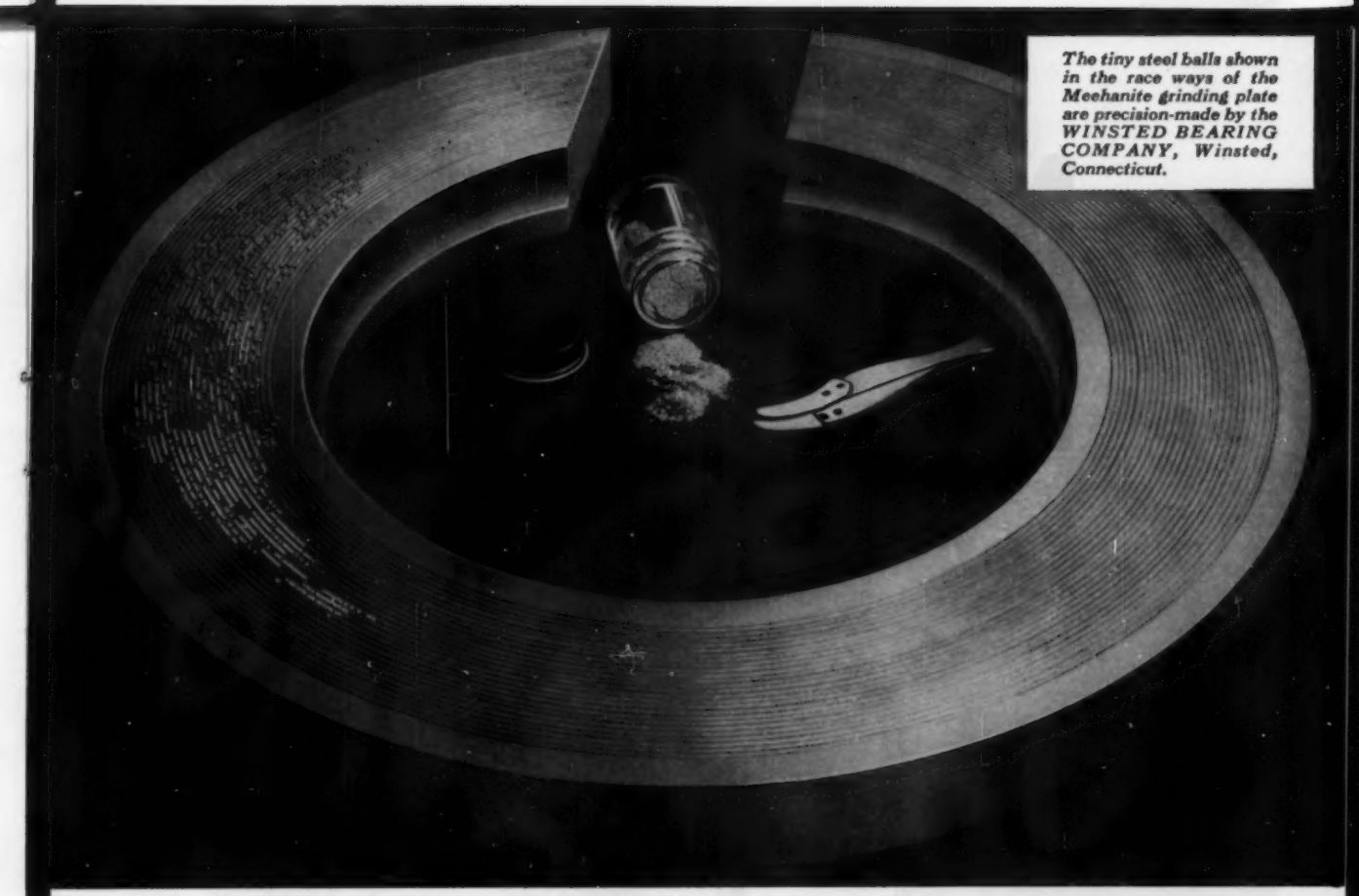
Hartley Foundry Div., London Concrete Machinery Co., Ltd., Brantford, Ontario
Otis Elevator Co., Ltd., Hamilton, Ontario

SEND FOR FREE BULLETIN

"Casting Soundness Can Be Controlled"

Write today to Meehanite Metal Corporation, Department 5E, 714 North Avenue, New Rochelle, New York.

MEEHANITE®



The tiny steel balls shown in the race ways of the Meehanite grinding plate are precision-made by the WINSTED BEARING COMPANY, Winsted, Connecticut.

Miniature steel balls are ground perfectly round on grinding plates cast in Meehanite metal

The fine grain structure and uniform solidity of Meehanite grinding plates enable the Winsted Bearing Company of Winsted, Connecticut to make miniature steel balls to the exacting requirements of the precision industries.

These exceptionally dense grinding plates, cast in quality controlled type "GA" Meehanite metal, provide long service life, maintain dimensional accuracy and can be heat treated without fear of distortion. In addition, Meehanite plates have high tensile strength (over 50,000 psi), high modulus of elasticity, low co-efficient of thermal expansion, excellent wear resistance and good machinability.

The tiny steel balls shown are used in miniature bearings, ball point pens and other precision instruments. They are made with the highest degree of uniformity and dependability. Each ball must be spherical within three to four millionths of an inch, can vary in size no more than five millionths of an inch and the surface finish must be better than half a micro-inch.

Meehanite grinding plates have been used by the Winsted Bearing Company for over six years with very satisfactory results.

If you would like more detailed information about the physical properties of Meehanite casting, write today for Bulletin AR-130 "Casting Soundness Can Be Controlled."

Over 20,000 steel balls ground perfectly round on Meehanite grinding plates are held in the teaspoon. The hermetically sealed glass jars contain over 50,000 balls.

MEEHANITE BRIDGES THE GAP BETWEEN CAST IRON AND STEEL®

MEEHANITE METAL

MEEHANITE METAL CORPORATION, NEW ROCHELLE, NEW YORK

AMES

...the preferred Dial Indicators...

have forged cases, backs and wheel supports for maximum stability

Accurate measurements depend on the complete absence of interfering factors. That's why Ames Dial Indicators have forged cases, backs and wheel supports for maximum dimensional stability. The extreme care put into the design and material selection of component parts typifies the Ames approach to manufacturing a superlative product. It's just one of the reasons why the lifetime cost of Ames Dial Indicators is lower, and why so many quality control engineers specify Ames as "preferred". Write today for complete information.

Representatives in principal cities

B.C. AMES CO.

26 Ames Street, Waltham 54, Mass.

MANUFACTURERS OF MICROMETER DIAL GAUGES • MICROMETER DIAL INDICATORS

would probably find himself more at home in the design department where the nature of the work requires the staff to have a broader background and thus be a little more adjustable to his likes and dislikes.

If a man's sliderule for values measures his environment rather than his check book, a pay cut exchanged for a shift in position may be a welcome move.

Joseph McLaughlin
Rockaway Beach, NY

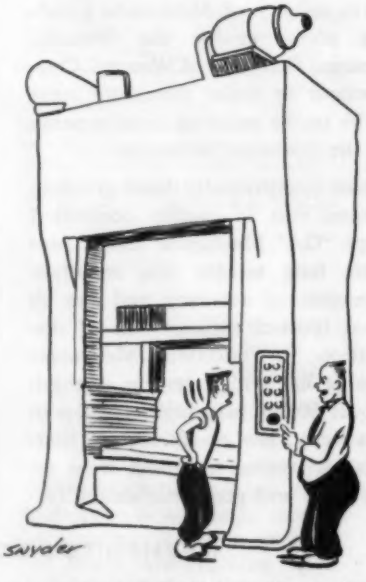
VIBRATING NERVES

Is it possible for a worker to become accustomed to the noise of his own machine, yet be bothered by the sounds of a less noisy machine next to him?

In your reader opinions on unnecessary noises in shops, it seemed strange that no one brought up what I consider a much worse nuisance than any machine-made noise: the radio.

No doubt the all-wise union boys count as one of the gaudiest feathers in their fringe-benefit caps, this "right" to hear "music" during working hours. But I wonder. May be a benefit for the lunatic fringe, which works at anything that pays well without too much labor.

Over a year ago I left a shop, partly because all through the night Lola got what Lola wanted, Henry



". . . And if you should touch this one by mistake it will shock hell out of you for not paying attention!"

Let's CUT COSTS

on these Secondary Operations

- DRILLING
- REAMING
- TAPPING
- TURNING
- MARKING
- PUNCHING
- GRINDING
- ROUTING
- SAWING
- THREADING

High cost second operations can kill first operation profits. If you perform any of the above secondary operations, better take a critical look at how you do it. There may be cost saving opportunities you've overlooked.

If any one of them involves hand feeding of parts or tools—hand clamping—or mechanical means of performing push, pull or lift motions—The Bellows Co. can save you money.

The Bellows Air Motor and the numerous Bellows packaged pneumatic work units can, in a few minutes, transform hand operated machines and machine tools into fast automatic or semi-automatic production units. They are inexpensive to buy—your own tool room can install them quickly.

Here's how to start—

Write for these two booklets. Bulletin ML-3 and BM-25 will give you a quick picture of what others are doing—of what you can do—in cutting second operation costs. Write Dept. AM957. The Bellows Co., Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., Toronto, Ontario.

The Bellows Co.
AKRON 9, OHIO

894-B

WILSON "ROCKWELL"—
THE WORLD'S STANDARD OF HARDNESS TESTING ACCURACY

WILSON "ROCKWELL"

DIAMOND
"BRALE" PENETRATORS

Your hardness testing is no better than the penetrator

A FULL WILSON LINE
TO MEET EVERY HARDNESS
TESTING REQUIREMENT

FULLY AUTOMATIC
•
SEMI-AUTOMATIC
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REGULAR
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SPECIAL
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SUPERFICIAL
•
TUKON MICRO & MACRO HARDNESS TESTERS

Every WILSON Diamond "BRALE" Penetrator gives you:

a flawless diamond • no chips, no cracks
precise accuracy of penetrator angle

Microscopic inspection finds and rejects any diamond with the slightest imperfection... comparator check, with hundreds of magnifications, assures essential accuracy and uniformity of penetrator angle ... your complete assurance of—

Accurate measurements • No rejection of good parts
No keeping of sub-standard parts
No risking good name with customers

The matching accuracy of WILSON Diamond "BRALE" Penetrators and "ROCKWELL" Hardness Testers, insure perfect hardness testing... EVERY TIME.

ACCO for Better Values

WILSON
MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE

ACCO

230-B Park Avenue, New York 17, N.Y.

FRICTION SAWING with...

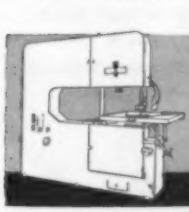
Tannewitz
HIGH SPEED BAND SAWS

SOLVES THOUSANDS OF PROBLEMS!

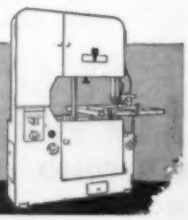
FOR EXAMPLE: cutting side panels of a barometric damper as shown above. Cost of dies required for seven sizes would have approximated $12,000—a prohibitive sum for volume required on these sizes. Friction-sawn on a TANNEWITZ High Speed Band Saw in multiples of two in 1.2 minutes each—a very moderate cost which makes feasible the complete line required. Cost of machine was only a small fraction of cost of dies contemplated and it is also available for many other uses.

For trimming castings, formed parts, cutting metal as hard as a file and dozens of other operations, too, friction sawing with TANNEWITZ High Speed Band Saws offers tremendous advantages. Write for free booklet, "FRICTION SAWING."

THE TANNEWITZ WORKS • GL 6-1729
GRAND RAPIDS, MICHIGAN



TANNEWITZ DIE-SAWS
24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Die Saws on the market. Write for bulletin.



SAWING MACHINERY SPECIALISTS

danced with her, whoever she was, and while I sweated over a dying turret lathe, the air was full of cherry pink and apple blossom white, which was no doubt stirred up by Davy Crockett. Never did figure how come the Super didn't learn until after my exit, that the same sterling character who insisted on his "right" to play the radio, was the same one who broke an average of a carbide reamer every other night.

Last summer it was in an instrument shop that I learned that there was a brass-throated something, presumably female, who or which was panting with a desire for me. Sorry, Toots, not interested. Getting middle-aged, and all that, y'know. It needs someone more scientific than myself to correlate the various failures and crackups in the air, on the rails, and the highways, with the divided allegiance between servicing and testing of equipment, and a well-known misanthrope whose mission in life appears to be to steal a little love, via the platters.

Am presently engaged in plastics fabrication. Over my head is the speaker which is daily engaged in testing the ultimate tensile strength of diaphragm materials, being jacked up so that I shall, nay, must get my share of "music." This, above the scream and roar of saws, hand, circular, and portable, routers, drills, sanders, shapers, and over all, the blowers which exhaust results of my toil.

If our Commie friends are bent on breaking us, mentally, spiritually, and physically, I can think of no better way than to get into as many unions as possible, and there insist on my right to hear music during working hours, even though I much prefer to hear music of my choice,

"Well, that's it B.B. According to my report we're losing 3.5% manhours from machine operators making up for industrial television!"

Put HOWELL in Your Product Picture

...and gain the

PLUS values in power

that count!

Are you selecting punch press motors that must "live in" and like the hot spots high up under factory roofs? Want a motor that's built to fill the constant stop-and-start requirements of heavy-duty machine tool service, yet be as good looking as tomorrow's most streamlined and automated machines? Then specify Howell, as machine tool builders and plant engineers throughout the metal working industry have been doing for years. Among many good reasons are these:

EXTRA DEPENDABILITY that challenges the years. Howell's new principle of heat-source ventilation . . . double sealed bearings . . . tough rolled steel frames and precision fitted cast iron end plates . . . these and many more are plus values that *count!*

AN UNSURPASSED REPUTATION for engineering excellence and quality manufacture . . . built up by Howell in over 40 years of serving industry's motor requirements.

TOPS IN APPEARANCE. No other industrial motors have such smooth, unbroken contours . . . without a fin or rib to mar their looks or catch dust deposits.

Howell makes virtually every type of AC industrial motor, fractional and integral to 300 hp, in all standard enclosures, in rerated and non-rerated frame sizes, also a wide range of gearmotors and brake motors.

among leading machine tool manufacturers who use Howell motors are these:

**The Cross Co. • E. W. Bliss Co. • Warner-Swasey Co.
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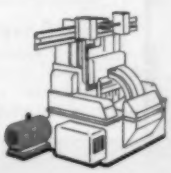
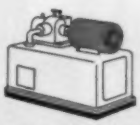
The Cincinnati Milling Machine Co. • Sundstrand Machine Tool Co.**

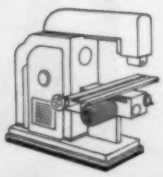
GRINDERS



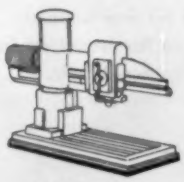
LATHES



HYDRAULIC SYSTEMS



MILLING MACHINES



RADIAL DRILLS

A Howell sales engineer can give you valuable assistance on any motor application. Wire or 'phone collect . . . or drop us a line . . . you'll get prompt action. Howell Electric Motors Co., Howell, Michigan.

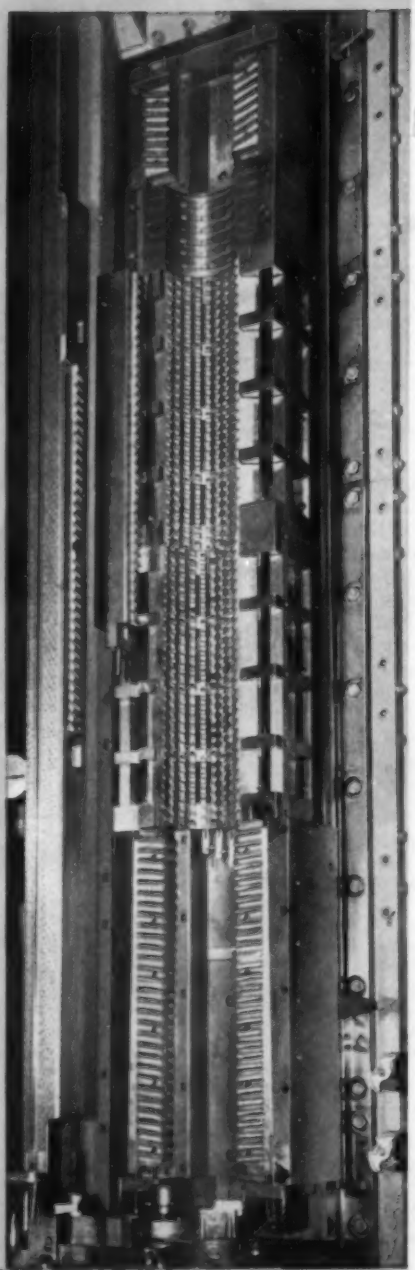
HOWELL *motors*

. . . precision built for industry since 1915

This 86-inch LAPOINTE -built BROACH SECTION

broaches 5 surfaces in one pass

- radius
- flat, adjacent to radius
- one side, at 90° angle to the flat, and adjacent to it
- two locating lugs



Using carbide-tipped broach sections to remove 1/8" to 3/16" stock per surface, a cast iron chain case cover is machined with mass-precision by Lapointe-Broaching — the fastest and most economical method of metal removal. Shown here, the 86-inch broach section is made up of a holder and master, and suitable sub-holders for ease of maintenance and handling.

At broaching speeds of 100 feet-per-minute and more, on many applications it is possible to broach upwards of 100,000 pieces *between sharpenings,* with Lapointe inserted type carbide broaches. This is real production economy, and shows the wisdom of calling on Lapointe's long experience in designing and making broaching tools.

Send for free booklet
"How to Care for Broaching Tools"
Ask for Booklet No. 2

LAPOINTE
known to be the best in
BROACHING

THE LAPOINTE MACHINE TOOL CO.
HUDSON, MASSACHUSETTS — U. S. A.
In England, Watford, Hertfordshire
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

at my own pleasure, in my home.

During the day, to me, the hum of machinery is music, and the stuff on the radio is noise.

Elmer F Korilla
Hasbrouck Heights, NJ

LOAN SHARK

Is it or is it not the foreman's business if one of the men in the shop is lending money to other workers and charging interest? If the borrowers are not complaining, and production is not affected, has the foreman any right to interfere?

We can't escape the fact that it takes all kinds to make a world. The machine shop has its share of characters, including the fellow who lives in a perpetual state of insolvency from one payday to another. When his fellow workers get tired of being his banker, and tapped for small loans, someone has to step in and fill the gap, which brings us to fellows like Mills, in this instance, who sees a chance to profit.

Unless Al can get definite proof that Mills is carrying on his money-lending activities during working hours to the detriment of normal production, I think he would be wise to ignore the small-time usurer. Too often these incidents can be blown up out of proportion to their nuisance value in the shop.

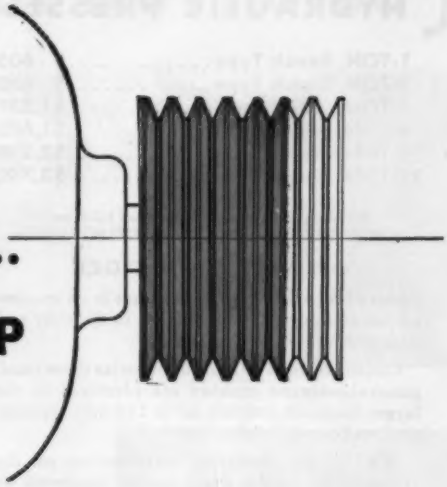
I would advise Al to disregard the busybodies who are so concerned about the moral tone of the shop. Usually they have their own little axe to grind. One thing is certain; any foreman who attempts to run his shop influenced by their advice is riding for a fall. I agree with

"The owner comes from one of those conservative old New England families. His ancestors and the shop tools both came over on the Mayflower."

5 Gates Super Vulco Ropes do the work of 7 standard V-belts

Use fewer belts...

but get same HP

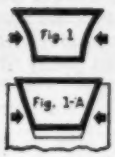


No other V-Belt has ALL these advantages

1. Flex-Weave Cover (U.S. Pat. 2519590)

A Gates exclusive: provides greater flexibility with far less stress on fabric. Cover wears longer . . . increases belt life . . . more power available to driven machine.

2. Concave Sidewalls (U.S. Pat. 1813698)



Concave sides (Fig. 1) increase belt life. As belt bends, concave sidewalls become straight, making uniform contact with sheave groove (Fig. 1-A). Uniform contact means less wear on sides of belt . . . far longer belt life.

3. Tough, resilient Tensile Cords

Super strong resilient tensile cords provide 40% greater horsepower capacity . . . easily absorb heavy shock loads . . . reduce number of belts required save weight and space.

4. High Electrical Conductivity

Built into Gates Super Vulco Ropes for safer drives (in explosive atmospheres).

5. Oil, Heat, Weather Resistant

Special rubber compounds make Super Vulco Ropes highly resistant to heat, oil, and prolonged exposure to weather.

Cut sheave width and weight . . . design your drive to benefit from the greater HP capacity of Gates Super Vulco Ropes.

5 Gates Super Vulco Ropes will do the work of 7 Standard V-Belts. A Super Vulco Rope Drive delivers more HP per dollar invested than any standard V-Belt drive.

Sheaves with fewer grooves cost less . . . weigh less . . . occupy less space. Your drive design is improved.

Helpful drive data is quickly available to you. Simply call your nearby Gates distributor for advice from a Gates V-Belt Specialist. Stocks carried in industrial centers throughout the world.

The Gates Rubber Company
Denver, Colorado

Gates Distributors are in the Yellow Pages

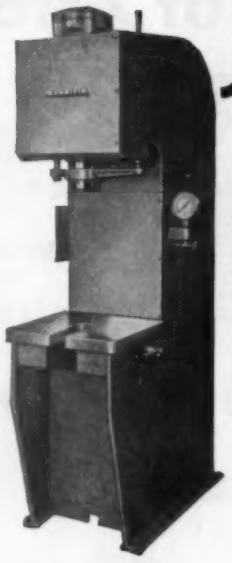
TPA 264

Gates — The Mark of *Specialized* Research

Gates Super VULCO ROPE Drives

PRICE LIST

ON HANNIFIN STOCK HYDRAULIC PRESSES



1-TON, Bench Type	$ 605
2-TON, Bench Type	$ 680
5-TON, with Base	$1,530
8-TON, with Base	$1,605
10-TON, Floor Type	$2,290
25-TON, Floor Type	$3,790

Prices complete with motors and starters F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

DELIVERY FROM STOCK

Demand for these popular presses is so consistent we are able to produce them in quantity and pass the savings along to you.

Construction-wise and quality-wise these small general-purpose presses are identical to the larger Hannifin presses, up to 150 tons. Special, optional controls when needed.

WRITE for complete information on the Hannifin Hydraulic Press you're interested in.

HANNIFIN

HANNIFIN CORPORATION, 517 S. WOLF ROAD, DES PLAINES, ILLINOIS

BUZZER REG. U.S. PAT. OFF.

INDUSTRIAL GAS EQUIPMENT

BURNERS & FURNACES (Heat Treating, Melting, Soldering)

NO BLOWER OR OTHER POWER NEEDED

. . . just connect to gas supply!

Outstanding service since 1911! Each unit, with the famous "BUZZER" Venturi, delivers the hottest, quickest heat attainable without a blower. Full range control of heat and turn-down. Standards or specials available for manufactured, natural or liquefied gas applications.

HIGH SPEED FULL MUFFLE FURNACES, Bench Type for heat treating high speed and alloy steels — temperatures to 2400° F.

LARGE FLOOR TYPE OVEN FURNACES for universal heat treating of larger pieces — temperatures to 2000° F.

WRITE FOR NEW "BUZZER" CATALOG

CHARLES A. HONES, INC.

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Ed that sometimes it is wisest to leave such a situation alone and let the men handle their own financial problems. In time, they smarten up to individuals like Mills.

In this connection it might be interesting to note that the credit union idea got its start over a hundred years ago because the mayor of a small German town became concerned about being pestered by the townspeople coming to him complaining about the local loan sharks. A company-sponsored credit union would put the small-time usurer out of business.

Robert S Alexander
Glastonbury, Conn

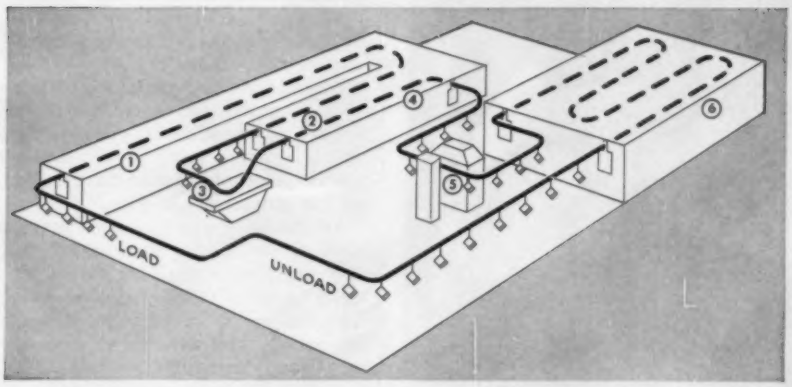
COSTS SCHOOL FOR FOREMEN

Can a training program on shop costs benefit a foreman, or is it a waste of time for an old-liner who feels he knows his own department's costs inside out?

THE intelligent foreman will recognize the value of a training program on shop costs and be a welcome participant in such a plan. Although it may involve his temporary assignment to a cost indoctrination group in another department, the inestimable value of the cost training program will more than offset any transitory disruption of the foreman's routine duties. A two-week stint in the cost department that will surely give the foreman a new slant on production costs, time study, and problems of labor productivity, is in line with the recent policy of broad-

"This new jet engine part passed every test we could give it, except one . . . it melts at room temperature!"

New and expanded line of equipment from DeVilbiss



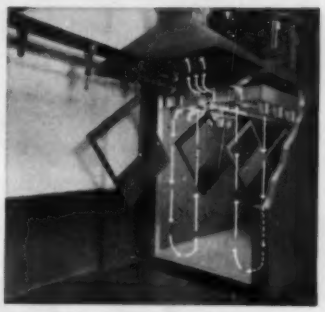
1. Phosphatizing Unit
2. Dry-off Oven
3. Dip Tank
4. Prime Coat Bake Oven
5. Automatic Spray Machine
6. Finish Coat Bake Oven

Now, through its new subsidiary —the Newcomb-Detroit Company—DeVilbiss emerges as the only "one-source" company that designs, manufactures and installs complete systems for all major types of finishing operations.

For large, diversified finishing departments, this means matched equipment for fully integrated systems, with performance guarantee a "one-source" responsibility.

For specialized shops or operations, it means you can select units of *any* kind or capacity for whatever method best suits your needs.

So, when planning to build, expand, or remodel your finishing department—or replace any component in your present system—call in DeVilbiss, the one-source supplier of all major finishing equipment.



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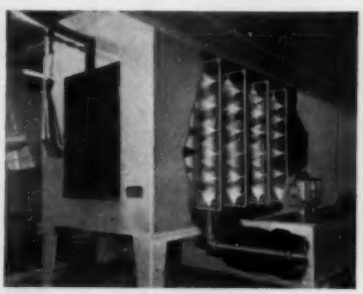

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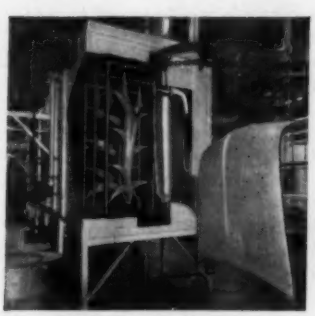
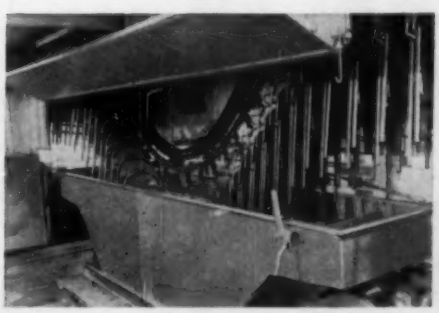


NEW! Flo-Coaters



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NEW! Dust Collectors

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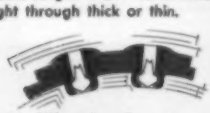
can probably save you money . . .

Even if your present fasteners are free!

Greater Design Flexibility
No need for access to both sides.

High Clinching Action
Exerts as high as 600 pounds squeeze between parts.

Wide Grip Range
Same length "POP" Rivet holds tight through thick or thin.



Vibration Proof
"POP" Rivets cannot back out or become loose. No lock washers or nuts required.

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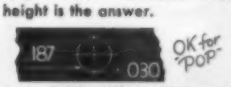
Where space is important, "POP" Rivets' minimum head height is the answer.



Less Critical Hole Diameter
Designer wants holes tight, production wants holes larger. "POP" Rivets make both happy.

Least Back-Up Space
Strong, high grip "POP" Rivets need only enough back-up space to provide room for set head.

When buying fasteners, do you figure the *installed costs*? A fastener considered alone may cost very little but be very expensive by the time it's installed and becomes part of a finished product.

"POP" Rivets afford greater flexibility in product design. Often operations can be eliminated, assembly costs reduced, and speed of fastening increased.

Many users find high strength "POP" Rivets the most efficient and economical fastener for their product. Investigate its use in your application. Perhaps you too can enjoy the many advantages "POP" Rivets have to offer. Write us today.

"POP" RIVET DIVISION

UNITED SHOE MACHINERY CORPORATION
West Medway, Mass.

ening the foreman's concept of how other departments operate and improving his own ability as a production supervisor.

The job of fabricating parts to exacting specifications is a teamwork operation. And if parts are to be produced at the right cost, the common ground between production foremen and production cost men should be recognized, and cooperation assured. There should be no doubt that an understanding of cost analysis will aid the foreman. A training program on shop costs, made available to foremen, will not only increase the foremen's knowledge of costs but engender cooperation between departments and result in a mutual exchange of information for the good of the company.

Of course it should be recognized that an old-line foreman may resent the implication that his knowledge of shop costs could stand an overhauling and modernization. Change, uprooting, and new experience are not exactly satisfying to middle-aged people as routine, security, and repetition. Excellent as the cost department assignment for foremen may seem to younger supervisors, it raises problems for old-line foremen; the most important being that not all men will take to it well. They may have to be sold on the value of knowing how the cost department operates and its relation to the work of production foremen. Broadened experience has no attraction for many of them.

Many people believe that foremen are born to their profession. This may well be true. But it stands to reason that the opportunity for foremen to view the job from a different perspective should be a welcome change and a real advantage in the execution of their responsibilities. It's a good idea for foremen and cost men to get together, even for so short a period as two weeks. The foreman benefits from the cost man's knowledge of cost analysis, time study, and job standards. The experienced cost man is a man who knows what acceptable shop performance is, and is able to assist shop foremen to maintain high labor productivity.

When a foreman begins his special training in a cost group, he's usually with men ready to talk his language, with the accent on productivity. He gets the requirements for production costs and the techniques which meet these requirements.

One cost training program for foremen with which I am familiar usually starts with the production cost supervisor who outlines the basic management requirements, the

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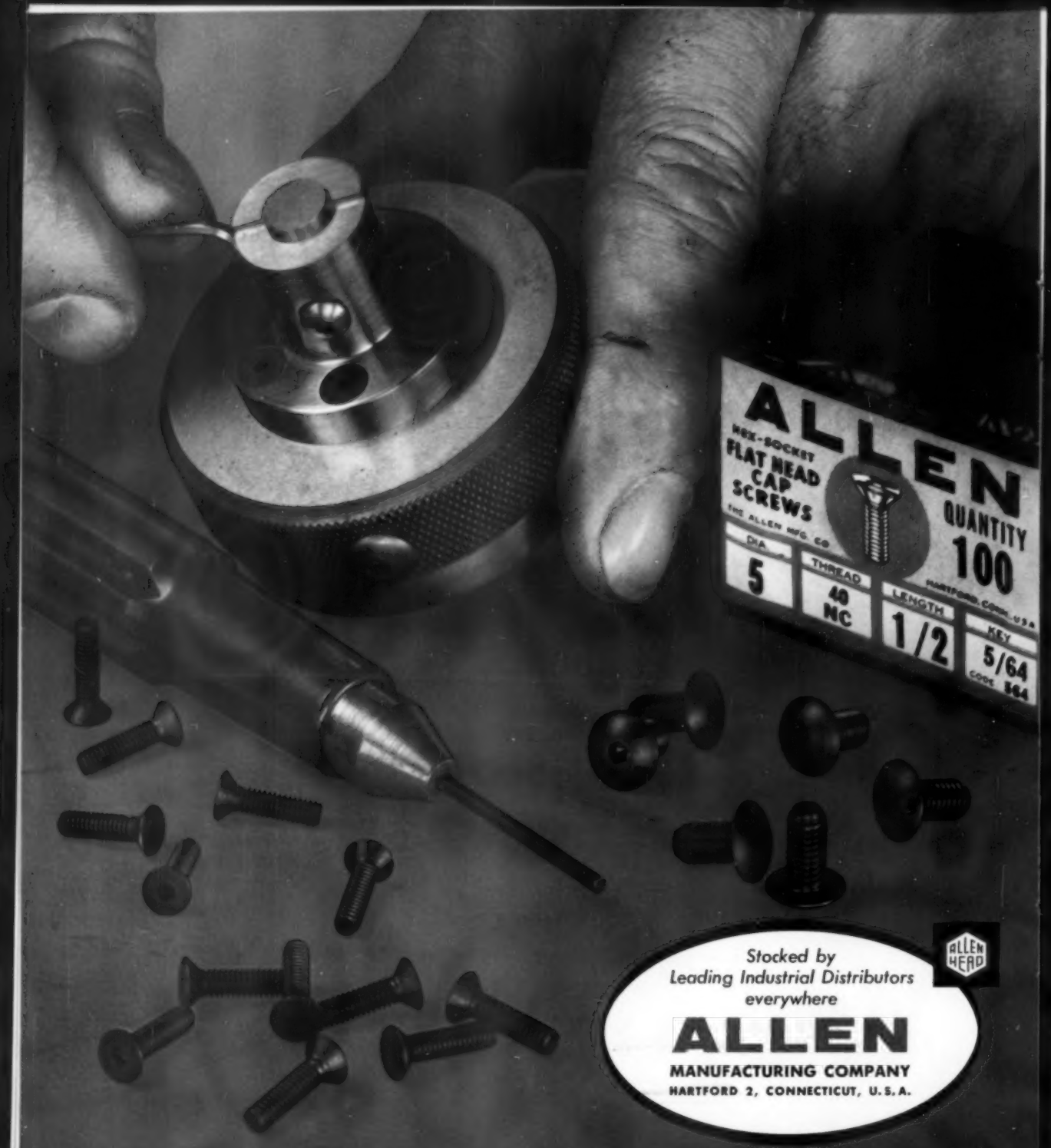

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reasons for these requirements as they relate to the over-all business, and the generalized techniques which meet these requirements throughout the plant. The importance of maintaining a high level of productivity at any point in the process of manufacture is discussed. The foreman's individual cost training program then is worked out to best fit his particular needs as a man responsible for a specific production function. The foreman is given a clear understanding of different cost techniques used in different manufacturing departments. The program includes the study of the purpose and make-up of production and cost reports, comparison of manufacture rates with production schedules, how time studies are run, and balancing of labor loadings. Included in the training course are visits with cost analysis groups in different departments of the plant. Basic concepts on the purpose of foremen and cost men are gone over thoroughly. Functions of the cost department are shown as necessary to the successful operation of the plant. The common job that has to be accomplished is considered and it becomes apparent that although the problems of the production foreman and cost man individually encountered on a daily basis are totally different, the objectives of the shop foreman and the cost man are identical, and that is to keep the shop running at its best possible productive level. It becomes clear that cost consciousness and directed shop supervision can unite into a winning combination.

The training program on shop costs also aims to clarify what a performance report is and to reduce

"On this job, you're not supposed to have the first dollar you ever made!"

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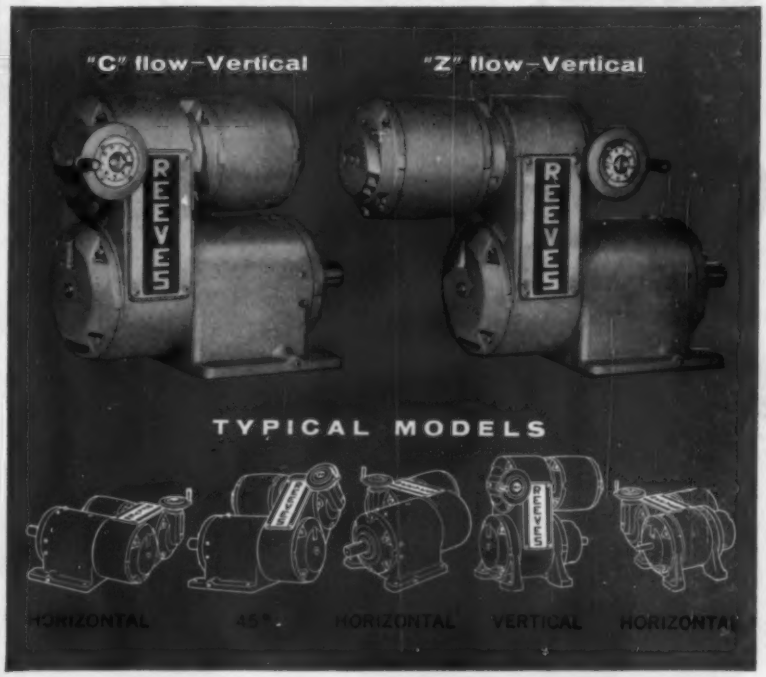

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"Immediately upon installation of the McCaskey System, the tool breakage began to decrease . . . and has now reached a point approximately 50% of the previous figure. The McCaskey system has also made it easier to maintain the minimum quantity of all tools without frequent excess purchase of any one item."

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it to its bare essentials in generalities that fit all departments. How the production standards are developed in a manner which is fair to management and to the shop personnel is discussed and explained. From these discussions and explanations the foreman will gain an understanding of the relation of costs to his own work as well as cost aspects of operations in other departments.

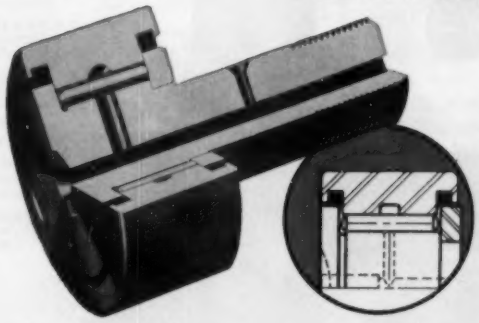
Although it is my opinion that the period of two weeks is all too short for a program of this nature, I nevertheless feel that it will prove of benefit to production foremen. To a considerable extent it will clear the air of any misconceptions of time study and will create an atmosphere which fosters the unity and harmony essential to the solution of mutual manufacturing problems by the foremen and cost men. The training program on shop costs will certainly have a broadening influence on production foremen. When they are convinced that they are constantly in a position to effect improvements in the current state of the business through better utilization of available cost methods and cooperation with the cost department, a pattern is set for greater production efficiency. The cost aspect of a job will certainly assume more tangible form. The control of shop costs will be firmer. Even an old-line foreman will have to agree that he's bound to bring some new ideas back with him as a result of the cost assignment. He may travel around in another department with some cost shark, but that's the kind of footwork that leads to cost-conscious headwork in the shop.

Harry Kaufman
Philadelphia, Penna

"Now there's an idea—a stupid one to be sure —but an idea."

BEARING TIPS by McGill

sealed CAMROL® bearings lock out contamination in critical cam follower applications

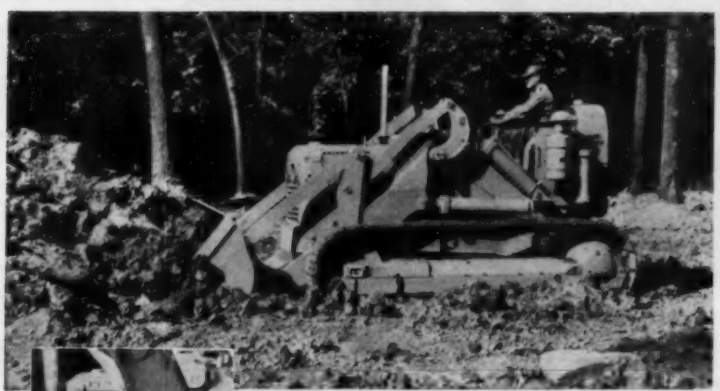


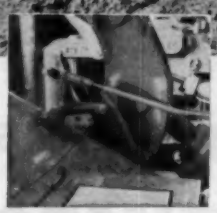
The new SCF series of the famous CAMROL cam follower completely seals out dirt, chips, moisture, etc. — an important advantage where the life of an ordinarily open mounted cam follower can be materially increased with adequate protection against contamination. Also the sealed bearing is pre-lubricated with provision made for easy re-lubrication, if desired, through either end of the stud.

Specially treated synthetic seals are contained in the outer race undercuts over the stud flange and roller retaining washer. For added protection, all external surfaces of the bearing are treated to provide a corrosion resistant, black ferrous oxide surface.

Now Sealed and Prelubricated

These same advantages are available in the SCYR sealed series Cam Yoke Roller (without stud). Specify CAMROL bearings with the built-in seals that preserve cam follower dependability in critical cam action, support or track roller application.





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McGill SCF series sealed CAMROL bearings provide the cam action that positions the bucket of the 977 Traxcavator unit at the selected digging angle. Mounted on bell crank arms that are actuated by contact with a cam shoe on a hydraulic cylinder, these bearings are operating in the open and exposed constantly to dust, dirt and moisture. External surfaces have a black ferrous-oxide finish to prevent corrosion. These sealed McGill cam followers eliminate the need for relubrication and maintenance after installation. Caterpillar uses other McGill bearings including twelve CYR series cam yoke roller bearings in the flywheel clutch.

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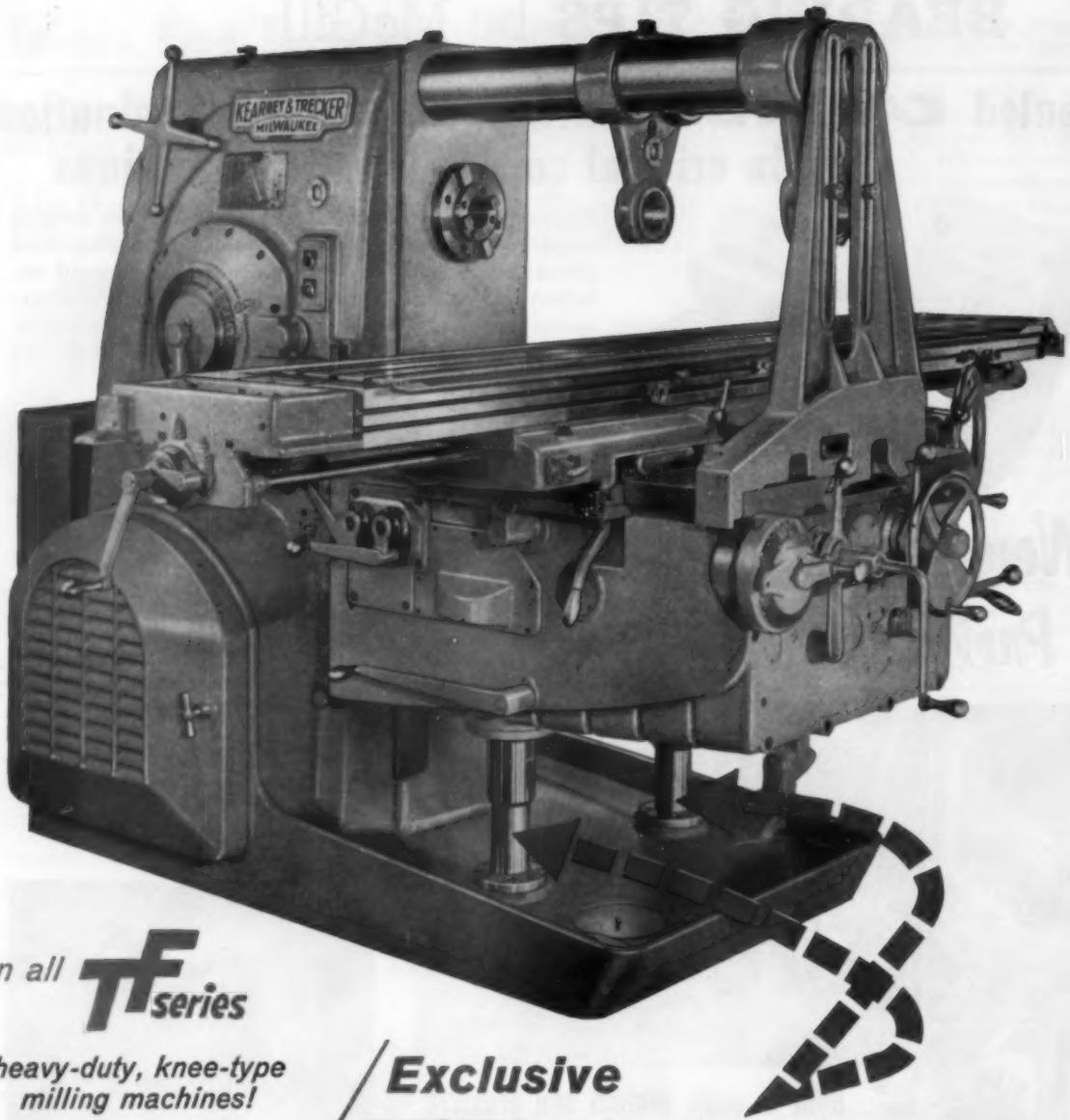

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TECHNIQUES OF PLANT MAINTENANCE AND ENGINEERING, 1957 — *Published by 1957 Plant Maintenance Show, Inc, 341 Madison Ave, New York 17, NY. 273 pages, 8½ by 11½ in. Price $10.*

This book is a record of the discussions held concurrently with the Eighth National Plant Maintenance and Engineering Show in January, 1957. It includes both the prepared papers and the informal extemporaneous question-and-answer sessions that followed them. It is the eighth in a series that began with the first conference in 1950.

Thirty-one addresses given at the conference are reprinted here; most are devoted to specific phases of the maintenance field, so that the finer points of the subject are covered as broadly and as thoroughly as possible. Anyone interested in either the general management aspects of maintenance or in specific technical problems should find plenty of descriptive material here.

•

SELECTION OF MANAGEMENT PERSONNEL—*Edited by M Joseph Dooher and Elizabeth Marting. Published by American Management Assn, Inc, 1515 Broadway, New York 36, NY. Two volumes, 542 and 364 pages, 6 by 9½ in. Price $15 (Members: $10).*

"Management skill is unlike any other skill. Managers require particular qualifications and preparation." This AMA handbook of management selection is aimed specifically at investigating the nature of managerial skill and determining what qualifications are needed for supervisory or executive jobs. Management is far more complex than it was 25 years ago, and industry is finding it harder and harder to select men of proper caliber for advancement. This two-volume work, which contains articles by leading authorities, case histories, practices established by leading companies, will be of interest to anyone faced with the problem of selecting management personnel.

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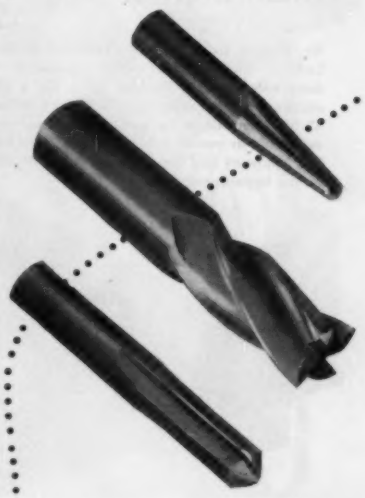

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for selection of management personnel. Here can be found the Armstrong Cork Co program for training supervisory candidates, the General Electric Co technique for selecting first-line supervisors and foremen, or the Sears, Roebuck plan for selecting and developing managers. In all, 19 company plans are presented.

•

BETTER WAGE INCENTIVES — *By Phil Carroll. Published by McGraw-Hill Book Co, 330 W 42 St, New York 36, NY. 230 pages, 6 by 9½ in. Price $4.75.*

Wage incentives, properly administered, can increase worker productivity tremendously. But when trouble arises—management errors, improper handling of grievances, poorly trained foremen—a wage-incentive plan often seems to cause more trouble than it's worth. This practical guide to the intricacies of incentives is designed to clarify the basic problems that arise in such plans. The chief causes of grievances are outlined, then each is covered in a separate chapter with suggestions for its solution.

Here are explained the procedures for initiating a new incentive program properly, as well as suggestions for improvement of programs already in existence. Separate chapters are devoted to such subjects as how to set standard element times, how to prepare for incentive arbitration, the role of the foreman, and what management must do to insure the success of an incentive plan.

•

BIBLIOGRAPHY OF FLUID POWER—*Compiled and published by the National Fluid Power Association, 1618 Orrington Ave, Evanston, Ill. 93 pages, 8½ x 11 in. Stiff paper cover. Price $2.00.*

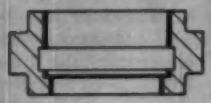
An effort to compile information of a cross section of the best books available on fluid power, this book has three major divisions—fluid power, hydraulics, and pneumatics,—in which the books are further classified as dealing with application, basic theory, control, data and tables, advanced theory, or general subjects.

For each book, the following information is given: author, publisher, date of publication, price, number of pages, illustrations, charts, tables, a condensation of the forward or introduction, and the complete table of contents.

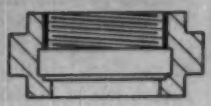
Bodine

case history no. 45

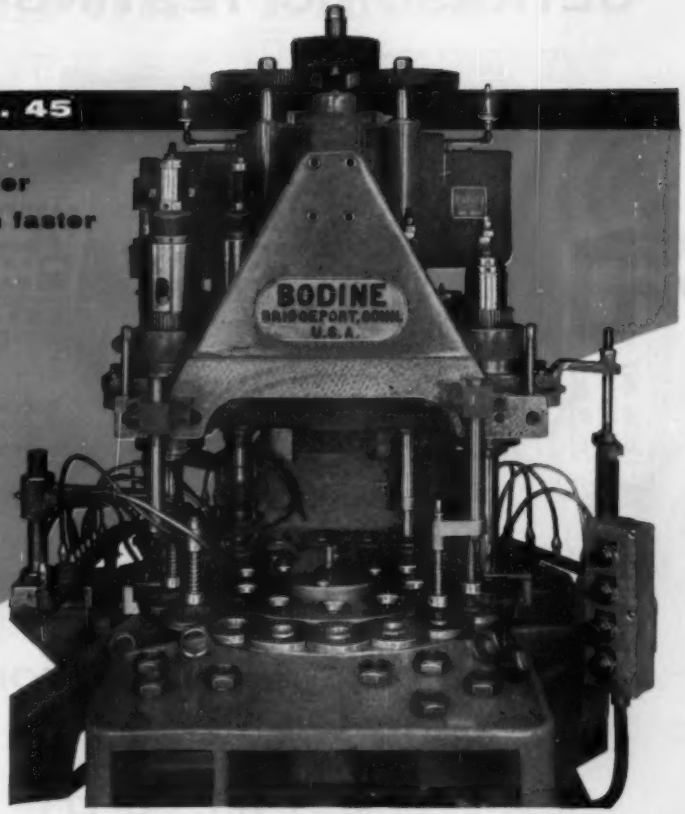
how DART makes better UNION NUTS . . . much faster



REAM and seat with combination tool



TAP . . . with collapsible tap (1.440-13 Thd; 1.703-12 Thd; 2.068-11 Thd.)



simplified, easily changed tooling handles sizes up to 2.068"-11 thread two at a stroke . . . 20-30 per minute

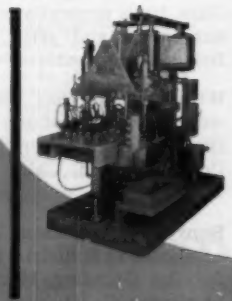
Not only does this Bodine 48-30 machine handle many size variations up to this husky maximum, it also makes much BETTER nuts because "floating" work holders have licked the problem of eccentricity in the castings.

Reaming is done with a carbide inserted-blade combination tool, the threading with a collapsible tap.

Changeover from one size of nut to another is quickly accomplished by changing cutting tools and inserts in the indexing dial. Bodine's standard 2" heavy duty flange mounted spindles are used.

Here's yet another instance where a Bodine Basic Machine and Bodine methods do a tough job much faster and much better at lower cost. Perhaps we can show you a way to do likewise. Write Dept. AM-9.

Production Data: Cast malleable iron nut sizes up to 2.068"-11 thread, machined 2 at a stroke . . . 1000 to 1500 pieces per 50 min/hr.

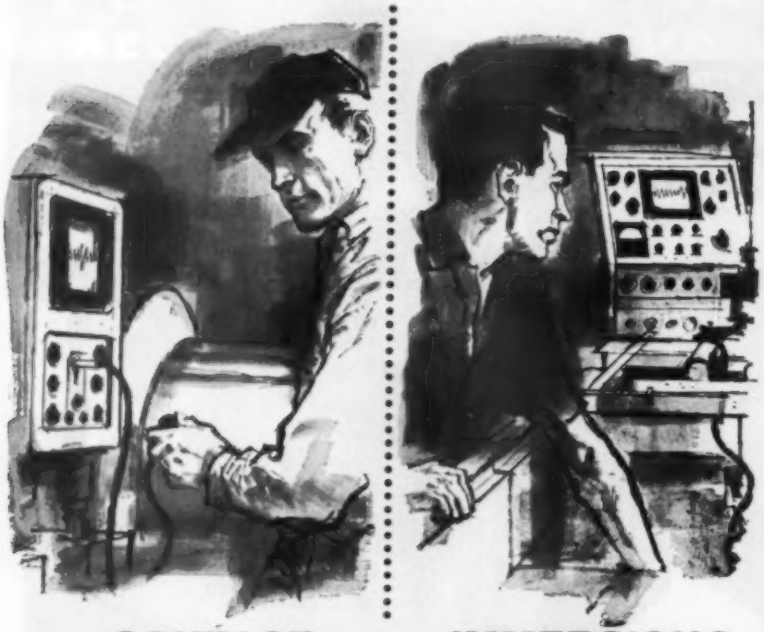


Is space a factor in your shop? This complete, compact Bodine production unit occupies only 5' x 8' of floor space.

THE **Bodine** CORPORATION
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

ULTRASONIC TESTING–



CONTACT or IMMERSION?

Either way, you're served best by the Sperry Reflectoscope

Both ultrasonic immersion and contact testing serve flawless purposes... the type to use is the one that serves your operation most effectively. The *equipment* to use to inspect your material or product for internal flaws is something we know a lot about.

The Sperry Ultrasonic Reflectoscope is admirably suited to *either* type inspection whether "tank" or "touch"... it can be used for one or the other with equally efficient results. Thus, you're not limited to one kind of testing. With the same basic equipment you could perform both immersion and contact testing if your operation required it. Or, whenever it was necessary, you could switch from one type of testing to the other. The Sperry Reflectoscope's "dual adaptability" makes it easy.

In manufacturing the Sperry Reflectoscope for both immersion and contact testing, we have acquired considerable experience in determining which type of testing is best suited to a given manufacturing operation. Should you require any assistance in this direction, we'll be only too glad to help you.

Complete Immersion Testing Systems, available at low cost, ready to use in the production line and laboratory. Call or write for specifications and descriptive literature.

To keep posted on latest developments in the profitable use of ultrasonic inspection, send for your free copy of our Ultrasonic Inspection News Letter. Write to:

Sperry

209 Shelter Rock Road Danbury, Connecticut

sperry products INC.

FIRST IN ULTRASONIC INSPECTION

NAMES IN THE NEWS...

David C Fulton has been appointed manager of the heat transfer apparatus department for the steam division of Westinghouse Electric Corp. He formerly managed the marine section steam sales department. **Edward E Lacy** has been named Pacific Coast manager of machinery electrification. Mr Lacy, who will make his headquarters in San Francisco, has been area sales manager for the South Pacific district in Los Angeles.

Robert O Wilder, executive vice president of National Forge & Ordnance Co, Irvine, Penna, has been elected president succeeding **John C Harrington,** named board chairman.

B W Sauter has been named general manager of the Westinghouse electronic tube division, Elmira, NY. He replaces **R T Orth,** vice president who has resigned. Mr Sauter has been manager of the receiving tube operations of the division.

Dr Lyman R Fink has been appointed general manager of the X-ray department of General Electric Co. He has been serving as manager of research application at GE's research lab in Schenectady.

E D Cowlin has joined Quality Fasteners, Inc, Kalamazoo, Mich, as vice president, sales. He was formerly general manager of the Reliance Division of Eaton Manufacturing Co, Massillon, Ohio.

W F Mericle has joined the staff of Cincinnati Shaper Co as export sales manager.

John B Graef, manager of engine sales for Westinghouse Electric Corp, has been named manager of aviation industry sales.

Richmond P Hobson has been named works manager for Universal-Cyclops Steel Corp's new stainless steel plant being built at Coshocton, Ohio. He is presently manager of the bar, wire, and strip mills at the Bridgeville plant.

William Mohr has been appointed works manager of the Pacific Coast Division of the Colorado Fuel & Iron Corp, Oakland, Calif. He was previously wire mill superintendent.

Henry G Mogensen, Jr, has been named Detroit district sales engineer for the Grinding Machine Division of Norton Co. He was formerly connected wth the Worcester sales office.

BRIDGEPORT BRASS
COPPER ALLOY BULLETIN

Bridgeport Brass Co. Reporting New Developments in Copper-Brass Alloys and Metalworking Methods

SPECIFY DURONZE WHEN YOU NEED A TOUGH, DURABLE ALLOY

by M. A. BUELL
Chief Staff Metallurgist

Duronze is one of the more versatile of the bronzes, combining the strong corrosion-resistant properties of copper with many of the mechanical properties of mild steel. It is available in several alloy compositions, the most popular of which are as follows:

	Duronze 606	Duronze 609	Duronze 707
Copper	96.00%	98.0%	91.0%
Silicon	2.85	2.0	2.0
Aluminum	—	—	7.0
Manganese	1.00	—	—

The Duronze family's high tensile strength and good machining make it a popular alloy for bolts, nuts, gears, valve stems and parts, and marine hardware.

Duronze 707 is best for machined and hot-forged parts. It does not, however, lend itself to cold-forming operations.

Duronze 606 and 609 offer, on the other hand, excellent cold-working properties in addition to excellent corrosion resistance.

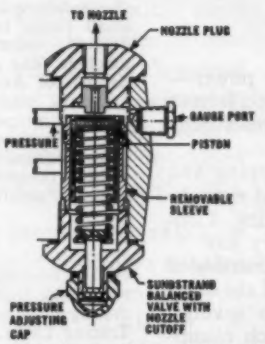
Full details on any Duronze alloy are available from your nearest Bridgeport Sales Office.

SOLVING YOUR PRODUCT AND PRODUCTION PROBLEMS

Of all the data, records and files kept by Bridgeport Technical Service, one of the largest is marked "Product and Production Problems —Solved." The experience brought to bear on a problem you may have with your product, or in the production of it, comes, in large measure, from cases similar to yours and frequently from cases exactly like yours.

Couple this successful experience with extensive facilities and you have a combination at your disposal that can be of great benefit to you. Bridgeport Technical Service works directly through your Bridgeport Salesman; when you outline for him your particular copper alloy problem you're calling on Bridgeport Technical Service.

Bridgeport Duronze 707 Helps Cut Cost of Vital Oil-Burner Pump Part



Schematic drawing showing position of nozzle plug insert in the burner valve assembly.

Bridgeport Duronze 707 nozzle port insert shown with nozzle plug.

The nozzle port insert for oil-burner pumps manufactured by Sundstrand Hydraulic Div., Sundstrand Machine Tool Co., Rockford, Ill., performs two vital functions: it provides positive fuel cutoff and prevents fuel leakage during stand-by periods.

For these reasons, metals specifications and machining requirements are exacting. Resistance to continual corrosive effects of fuel is a must. Also, the material for the part has to be machined to close tolerances and must be capable of good surface finishes.

A Bridgeport salesman noticed that this insert was being machined from leaded phosphor bronze. He studied the materials specifications and production methods, then recommended a shift to Bridgeport Duronze 707 (Aluminum Silicon Bronze).

First, Duronze made possible substantial savings in materials cost. Second, Duronze's resistance to fuel-oil corrosion was equally as good as the previously used metal. Third, although the machinability of Duronze was slightly less than leaded phosphor bronze, the Bridgeport man's recommendations made the difference in machining time negligible.

The results speak for themselves. Sundstrand now uses Bridgeport Duronze 707 for the nozzle port insert on their *entire* line of oil-burner pumps.

BRIDGEPORT BRASS
Bridgeport Brass Company, Bridgeport 2, Connecticut. Offices in Principal Cities
In Canada: Noranda Copper and Brass Limited, Montreal

Skinner power chucking equipment makes old lathes perform

Better than New!

It's easy to convert your present lathes to Skinner power—and the savings will start at once. Automatically, you'll have high-production machines that slash your over-all machining time and costs.

Take Skinner Power Chucks, for example. Gripping and releasing are done instantly by compressed air. Hand wrenching is eliminated—work goes faster, is far less tiring. Consider what this feature alone will save you on every job!

For turning between centers, famous Skinner-distributed +GF+ Work Drivers need only an easy half-turn of the hood for fast, sure clamping. Here, too, speed means savings. Work Drivers grip out-of-round work evenly, match clamping force to cutting pressure, drive any round or smooth blanks, from 1/4" to 8 1/16".

No wonder more and more manufacturers are turning to Skinner with all their power chucking needs. Let us show you how the wide range of Skinner power chucking equipment can modernize your lathes!

Send for specifications, applications and installation instructions. Write Dept. 109.

Skinner Power Chucks and air cylinders are available in a wide range of sizes. The "Junior" power chucking unit shown here will convert most small lathes to a high-production, more economical machine. The complete unit consists of double-acting 6" cylinders, adapters, regulators, valve and 8" self-centering chuck with gripping capacity from ¼" to 6". Individual components are also available separately.

Here a manufacturer uses a +GF+ Work Driver to replace driving dogs on a Monarch Tracing Lathe. The lathe is used to make jig borer lead screws and the part must be removed at least five times for the entire operation. Think of the savings here, when hand wrenching was eliminated!

Skinner Power Chucks and +GF+ Work Drivers are available through leading Industrial Distributors everywhere.

SKINNER CHUCKS

THE SKINNER CHUCK COMPANY

ESTABLISHED 1887

NEW BRITAIN, CONNECTICUT

Solve Your *Special* Resistance Welding Problems with Mallory *Standard* Electrodes

BEFORE you pay the extra price of special electrodes, both in added cost and longer delivery, it pays to check the many types available as standard from Mallory.

In the Mallory standard list are literally hundreds of designs . . . all available promptly, manufactured by existing tooling. Many are carried by Mallory distributors for immediate delivery. Included are cold formed single and double bend types—cast and forged off-set designs—a wide choice of nose shapes, tapers and lengths—and models with Mallory's special fluted cooling hole, for efficient cooling right up to the electrode face. All are made from the specialized alloys and by the precision manufacturing methods that Mallory has developed during more than thirty years of resistance welding leadership.

Your local Mallory Welding Distributor can lend valuable help in working out ways to use this broad line of electrodes to solve "special" problems at "standard" prices. And he can give you prompt delivery, usually from his local stock, of exactly the electrodes you need. Write to us today for the name of the Mallory Welding Distributor nearest to you.

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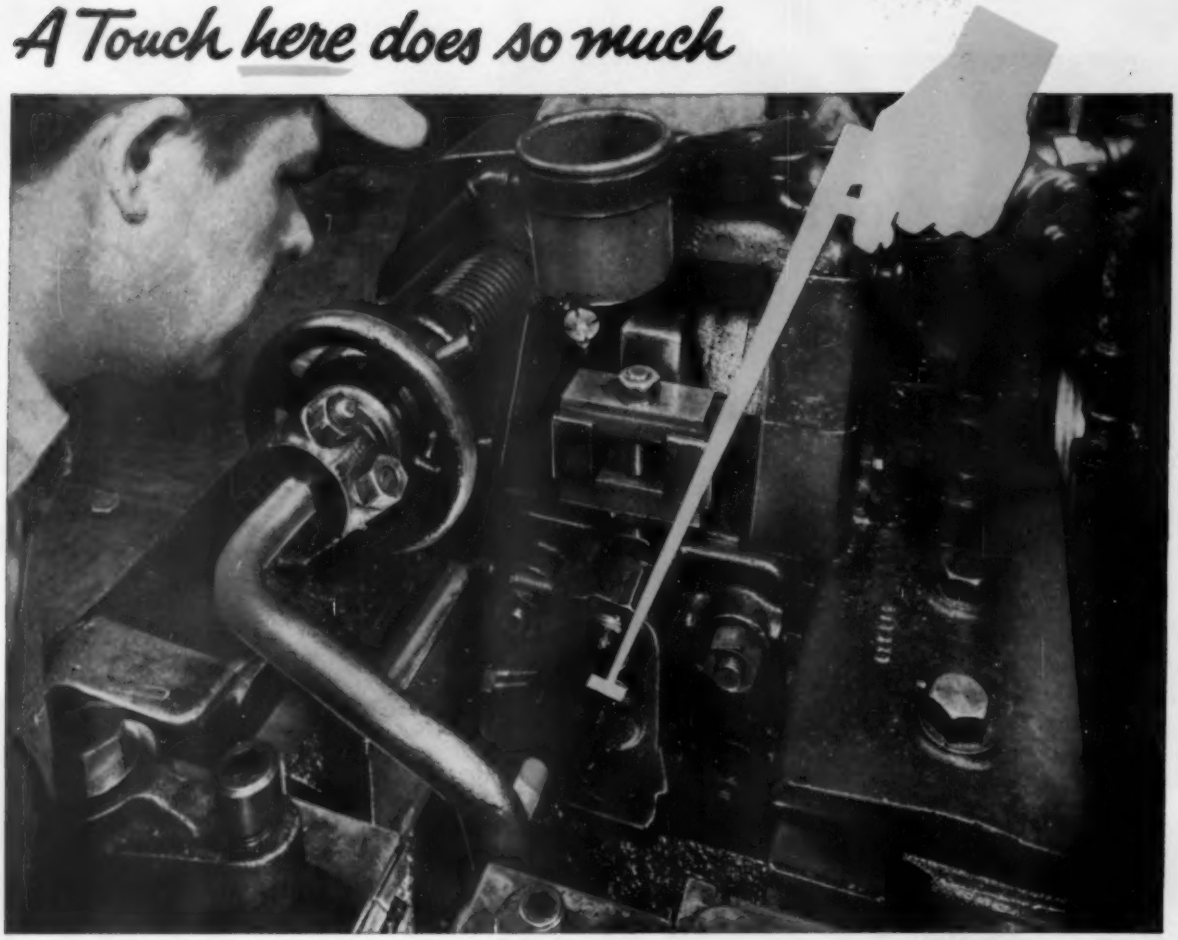
A Touch here does so much



COOL PROFITS FROM HOT HEADS

A touch of 'dag'® 200 on the punch that sinks hexagonal recesses in steel screwheads increases efficiency 40%, doubles production, and improves quality. Two operations and a bulky machine are eliminated, and 42 square feet of floor space gained per machine. Life of the hex punches is extended over 500%.

Before using 'dag' 200, the die in the hammer head seized and pulled out when punched into the white hot blank, resulting in costly rejects and downtime. The unique properties of 'dag' 200, a dispersion of molybdenum disulfide, keep the hammer slamming 2,500 blanks per die — six times more than before. Three hours' downtime is saved per die, and only two-and-a-half gallons of 'dag' 200 are needed to produce 21,000 units.

This is only one of the many Acheson colloidal dispersions which keep things moving fast in hundreds of industries. Talk with your Acheson Service Engineer soon, and write for Bulletin 426, Metalworking Applications. Address Dept. AM-9.

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ACHESON COLLOIDAL DISPERSIONS:
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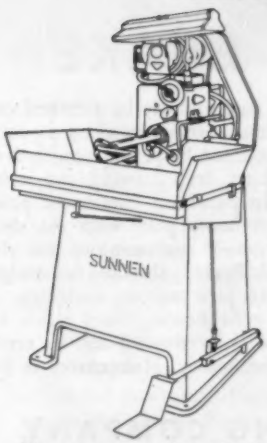
HOW WOULD YOU CHUCK THIS PIECE?

Problem: Finish I. D. perfectly round, straight and smooth



Diameter range of standard honing tools: ⅛" to 2⅝"

The only answer: *Don't chuck it!*

The slightest radial chuck pressure or end clamping would distort this thin-walled part and result in spring-back after boring or grinding.

Sunnen Honing handled the job successfully because the workpiece is self-supporting on the honing tool. As the part is hand-held, there's no localized pressure to cause distortion . . . no strain to cause spring-back.

Your problem may not be this difficult, but Sunnen Honing can save you money if you do precision internal work of any type. It requires no jigs or fixtures, guarantees accuracy to .0001" and produces any finish down to 2 micro-inches. Average honing machine installation with tooling is about $1,000.

send for five informative

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300 ton Pacific Hydraulic Brake is accurate within thousandths of an inch. Angles from top down are 90°, 116°, 100°, 120°, 166°.

Presetting controls for the different angles to be formed consecutively.

forms 7 different angles in succession without resetting controls

PACIFIC HYDRAULIC PRESS BRAKE

In a single handling of metal, Pacific Hydraulic Press Brake forms an entire series of different bends. You set the controls just once and run through the entire sheet or plate. Handling time is cut to a minimum. Operating on the "air bending" principle, the ram comes down to a different depth with each stroke forming the various angles preset on the controls. Each bend is accurate within thousandths of an inch. The length of stroke can be adjusted to match any job; bends up to 12" deep can be formed in a single stroke while the stroke can be reduced to less than 1/8" and the press will cycle 50 strokes per minute or more.

The ram is held level automatically by patented controls so that work can be done at any point along the entire length of bed. Thus a piece can be passed progressively from die to die for blanking, deep drawing, embossing, punching and forming. In punching, continuous power drives the punch through heavy plate with the shock being absorbed by the hydraulic cushioning of the cylinders. This Pacific Hydraulic Brake is also used for straightening, rubber pad forming, pipe making, stretching, extruding, hot forming and even shearing heavy plates. The Pacific cannot be jammed or overloaded and its precise accuracy is maintained indefinitely. Maintenance is low.

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Watchdog on mounting costs

PRICES of common materials keep going up. Many new alloys are costly. Hence, rough castings become more expensive.

Even more, the cost of machining time keeps mounting. No one can afford to have it wasted by waiting for the tool to locate a void or defect.

So now is a good time to re-examine the importance of radiography. To suppliers it gives the assurance that only a quality product is delivered. To processors it gives the confidence that man and machine time will be productive—not wasted.

Today, million-volt x-ray equipment radiographs heavier parts with shorter exposures. The use of radioactive isotopes makes possible a radiographic department at moderate cost. And the new Kodak Industrial X-ray Film Type AA—with up to twice the speed of the previous film—widens the scope of all radiographic equipment.

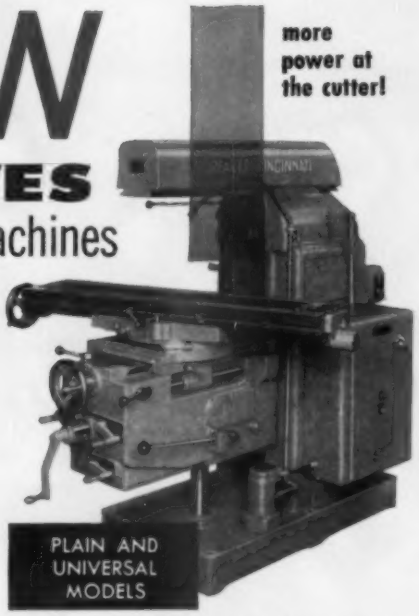
If you would like to know how radiography can save you money—how it can keep the quality of castings high—have a serious talk with your Kodak x-ray dealer or Kodak technical representative.

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Kodak
TRADE MARK

new GREAVES 2-XH Milling Machines

more power at the cutter!



The completely new GREAVES No. 2-XH Milling Machine brings added versatility, increased operational ease, and more power where it's needed most . . . *at the cutter!*

It utilizes two motors, one for spindle drive; a separate motor for moving table, saddle and knee. Compare this and the other outstanding features of the new Greaves Mill. You'll see why Greaves is "The MOST Mill for the LEAST Money."

Write for detailed literature!

- Wide range of speed/feed combinations for any type material, any type job.
- Heavy, internally ribbed column casting and heavy duty rectangular overarm for maximum rigidity.
- Large, heavy-duty knee, saddle and table provide accuracy for all types of milling.
- New 7½ HP spindle drive motor, with separate motor for movable components, provides extra power for heavy milling.
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- Separate drive motor for table, saddle and knee provides more smooth balanced power at the cutter.

GREAVES

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From the *American Machinist* Library of *Tips for Top Shop Men*

THERE'S an old saying that "If you want to be big, you've got to look big." Nobody likes a fourflusher or a fop, but everybody has been trained from childhood to expect a leader to look like one. Company policy can't earn respect on the major things either, if it is small on the minor things. Don't make your company look small.

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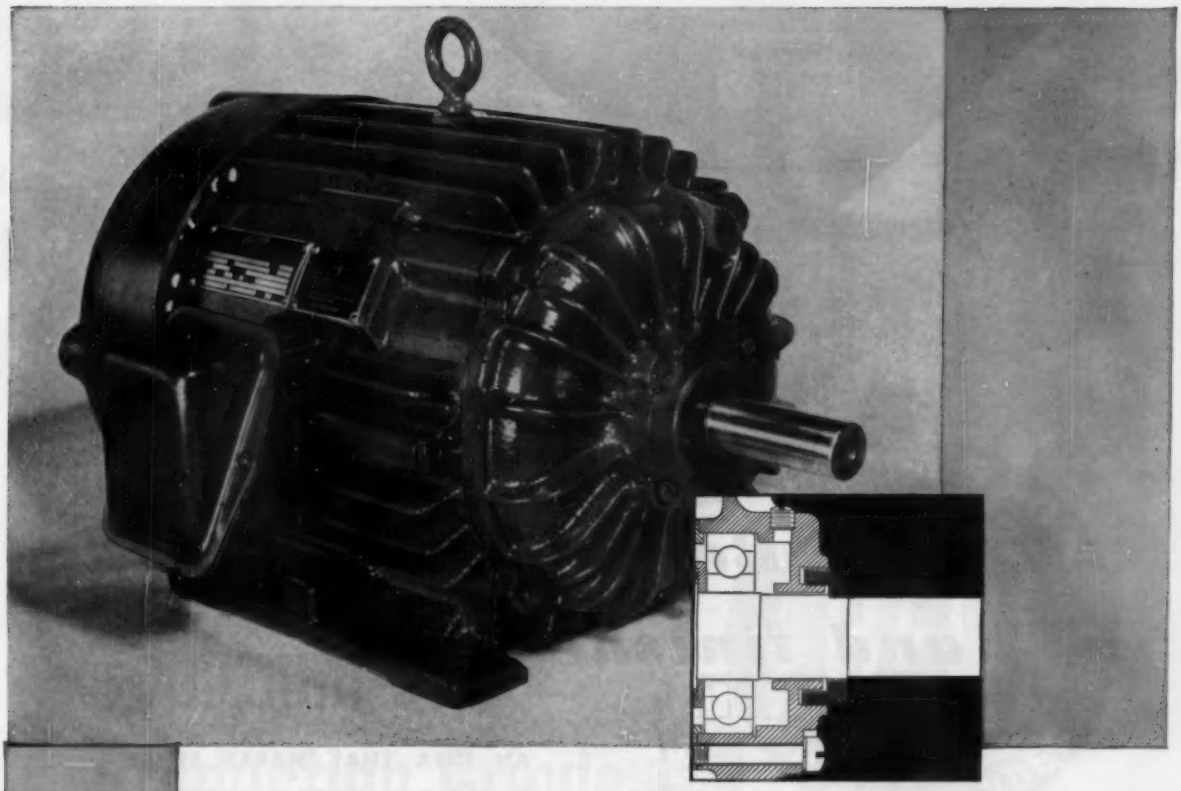

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Outside, a hose or whisk broom quickly cleans it. External fan forces jets of cooling air across the frame. Inside, vital motor parts are completely sealed off from injurious atmosphere. Factory lubrication of bearings is adequate for several years' service under normal conditions; however, whenever required bearings may be relubricated through grease plugs.

For full facts on your specific application, call the Century District Office or Authorized Distributor nearest you.

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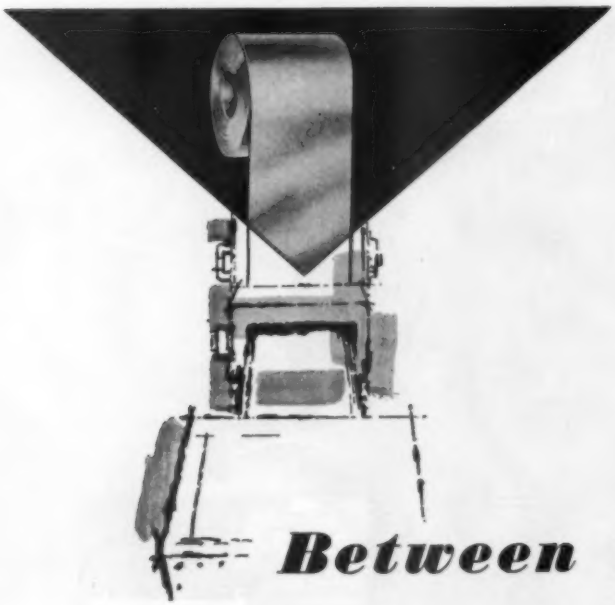
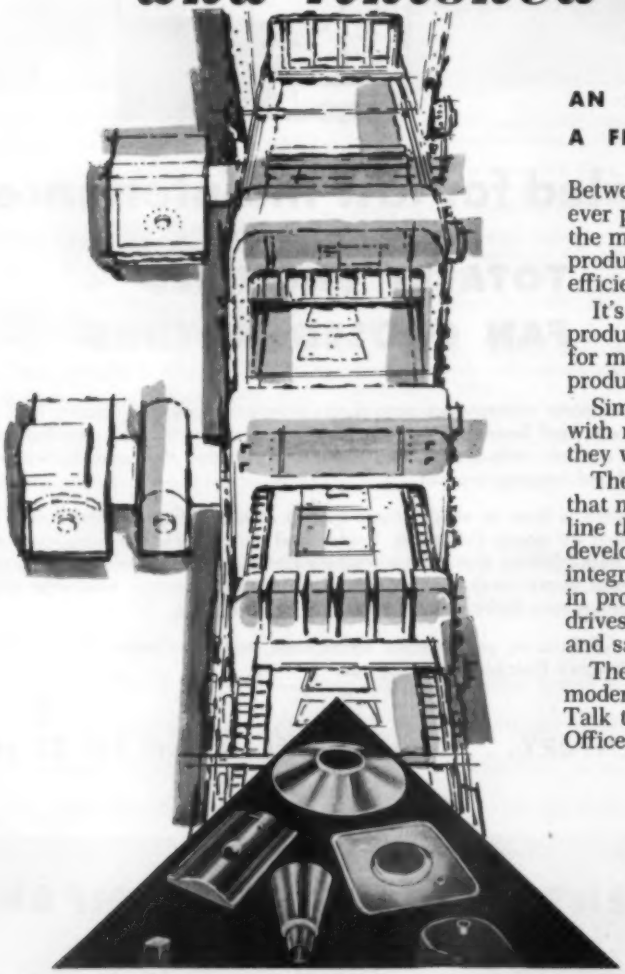


Between material and finished part . . .



AN IDEA THAT MAKES SENSE —
A FEDERAL-WARCO PRODUCTION LINE

Between material and finished part is the ever present problem of bringing together the machinery necessary to perform all production on operations as speedily and efficiently as possible.

It's here, the Federal-Warco, this packaged production line has proved to be the answer for many of the nation's foremost production experts.

Simply provide Federal-Warco engineers with material and part information and they will develop a line to do the job.

The advantages: One source responsibility that means faster, more thorough service; a line that is 100% harmonic, all stations developed especially to work in synchronization; integrated and automated handling of work in process; the possibility of utilizing common drives and bases, reducing operating costs and saving valuable floor space.

There is much more. Why not look into this modern method of production line manufacture? Talk to your Federal-Warco representative. Offices in all leading industrial areas.

Federal / Warco
PACKAGED PRODUCTION LINES

THE FEDERAL MACHINE AND WELDER COMPANY • WARREN, OHIO

REID PRECISION SURFACE GRINDERS REID PRECISION SURFACE GRINDERS REID PRECISION SURFACE GRINDERS RE

REID PRECISION SURFACE GRINDERS REID PRECISION SURFACE GRINDERS REID PRECISION SURFACE GRINDERS REID PRECISION SURFACE GRINDERS

MODEL 618P
(large illustration)
with dust collector,
and (small illustration) with
wet grinding attachment.

A Complete Line of 618 and 824 Toolroom and Production Grinders

. . . and accessories

REID . . . the quality name in surface grinders! Choose from three different models in the 618 class; capacity 6″ wide, 18″ long, 17¼″ from spindle center to table. Accessories can be supplied for wet grinding, cool grinding, dust collecting, etc.

REID-O-MATIC 824 . . . this fully automatic surface grinder has a capacity of 8″ wide, 24″ long and 21″ from spindle center to table. All-electric controlled — solid construction — available with accessories above.

Get *all* the facts on REID grinders . . . your best buy for toolroom and production economy!

REID-O-MATIC 824

Bulletins
Write for brochures on the REID 6-18 and REID-O-MATIC 8-24 for complete details

REID BROTHERS COMPANY, Inc.

136 Elliott Street, Beverly, Massachusetts

MANUFACTURERS OF PRECISION GRINDERS AND PRODUCTION LATHES

MAXITORQ "DISC-PAC"

A COMPACT UNIT FOR BUILDING YOUR OWN CLUTCH

Due to a growing demand for Maxitorq Floating Discs, the MAXITORQ DISC-PAC has been made available as a self-contained unit independent of the actuator.

Patented Maxitorq Separator Springs that prevent drag, abrasion, and consequent heating in neutral . . . and the Maxitorq Locking Plate which locks all discs onto body . . . give you the outstanding features that are so highly favored by machine and product designers.

Thus you may build your own clutch or brake from our standard stock Maxitorq parts. The Disc-Pac keys to your shaft and is easily replaced. Units are available in 8-disc diameters from 2" to 8"; ¼ to 15 h.p. at 100 r.p.m. . . . with 3 lugs on the smallest size, 8 lugs on the 3 h.p., and 12 lugs on the 5, 10 and 15 h.p. capacities.

The Disc-Pac fits Maxitorq standard Driving Rings in the event that you want to use them. As with the Maxitorq Clutch, all assembly, take-apart and adjustments are manual . . . no tools required. For further information, write Dept. AM-9.

THE CARLYLE JOHNSON MACHINE COMPANY

Manchester, Connecticut

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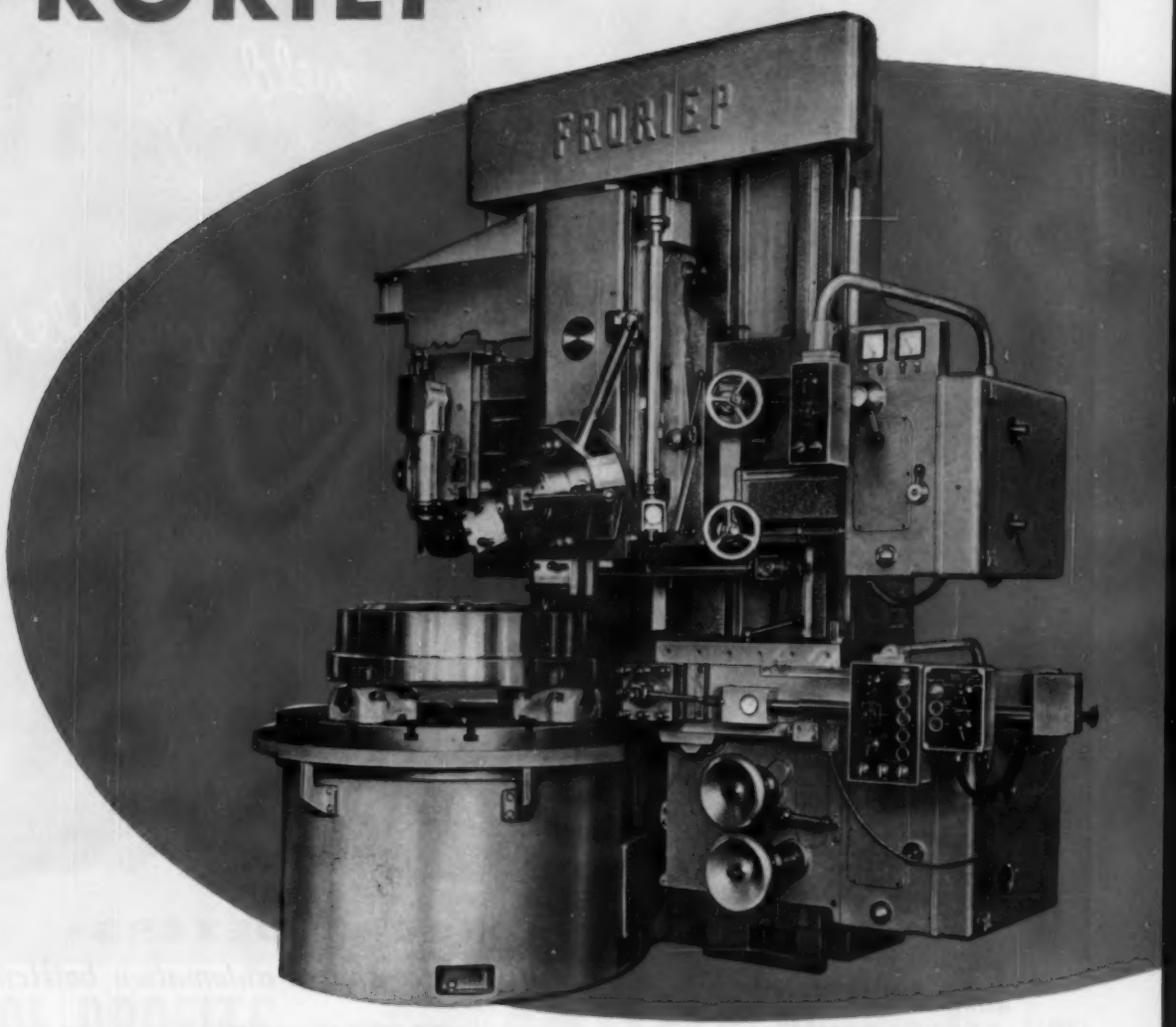

PUSH-BUTTON CONTROL CUTS "DOWN-TIME" ON VERTICAL TURRET LATHE

Buttons and switches — on conveniently placed pendants — control table speeds, feeds, and rapid traverse.

Speeds can be changed during cut—automatically, if desired.

By the use of tripping devices, diameters and depths can be repeated within set limits. Only finest adjustments need be made by hand. Feeds may be pre-selected.

Automatic copying attachment with electric tracer.

Four heavy-duty sizes: 40", 49", 55", and 63" tables. Each has 18 table speeds—side heads and vertical heads have 12 feeds each.

Prompt service and spare parts as close as your telephone.
Froriep Machine Service Corp.
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COSA — *nationwide sales and service of precision machine tools — from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

IN CANADA contact COSA CORPORATION OF CANADA LTD., 1160 Lakeshore Road, Long Branch, Toronto 14, Ontario

Models 400 and 600 Erickson Speed Indexers. Standard index plate provides 4, 6, 8, 12 and 24 positions; special parts provide up to 50 positions on Model 400, up to 100 positions on Model 600. Other models available.

Angular accuracy within 2 minutes... repetitive accuracy in low "tenths" of a thousandth

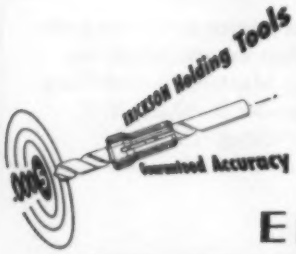
ERICKSON INDEXERS—

the economical way to smash automation bottlenecks

Even the most elaborate automatic production line can bog down *expensively* without rapid and accurate automatic parts positioning.

That's where Erickson Indexers really pay off. For you can interlock them into your production set-up with micro switches and solenoid valves. The hardened and ground lock pin operates in conjunction with the actuating mechanism to assure *positive positioning and angular accuracy within 2 minutes of a degree.* (Repetitive accuracy is no indication of angular accuracy. Erickson holds repetitive accuracy in low "tenths" of a thousandth.) And Erickson Indexers can maintain this great accuracy because their adjustable, self-contained shock control unit delivers a cushioned rotary load to the mechanism, thereby reducing wear.

Speed to keep lines moving . . . accuracy to reduce rejects . . . long life to cut maintenance and capital investment—all add up to Erickson Indexers, the *economical* way to smash automation bottlenecks.



Write for Erickson Catalog K today! You'll find many interesting applications for all Erickson holding tools. Take advantage of our free engineering service. An Erickson field engineer will gladly work with you for production economy.

ERICKSON TOOL COMPANY

2309-A Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

AA-3137

ANTISEP the all-purpose water-soluble cutting base

COOL PROFITS -- when ANTISEP works for you

Longer tool life, higher quality work, more output per machine . . . all at a cost of 8c per gallon of coolant in the machine! That's the kind of increased profit story that is being repeated in shop after shop where ANTISEP is on the job.

ANTISEP All-Purpose Base gives you everything you want for tough machining jobs. Its extra lubricity insures fast, free cutting on tough metals. Its high film strength and anti-welding properties help prevent chip build-up on tools. Because it is mixed 25 to 1 with water, it keeps tools and work cooler than any straight cutting oil could. You can step up production and still have a smoke-free plant and finer finished work.

Decide today to try ANTISEP. Your Houghton Man will be glad to arrange a test in your plant . . . or write to E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

ANTISEP all-purpose cutting base

...a product of

E. F. HOUGHTON & CO.

PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

it's a job for CDT

Faced with a special tooling job? Stymied by a tough problem? Would 50 years of experience help? Then the logical answer for you is to send it to Columbus Die-Tool! CDT specializes in tools, jigs, fixtures and also special machinery, designed and built to produce your products better, faster, and more economically.

That's why so many of the nation's leading manufacturers avail themselves of the specialized services of Columbus Die-Tool. Perhaps CDT can solve your tooling problem and help you make your product . . . better for less.

Columbus Die-Tool
AND MACHINE COMPANY

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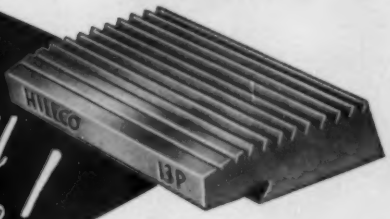
Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

"HILLCO" TANGENT CHASERS

We think you'll agree!



The new line of "HILLCO" Tangent Chasers, which can be re-ground for 80% of their original length, are guaranteed to be of highest grade tool steels ground to exacting tolerances. We feel that this complete line of chasers are the finest that we have produced in our 75 years of cutting tool manufacture. We think that you will agree with us.

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ACME MACHINERY DIVISION
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Our 70 years of Gear Experience will prove invaluable in your Gear needs

- **CONTINUOUS-TOOTH HERRINGBONE**—The gear with the backbone, made up to 60" in diameter
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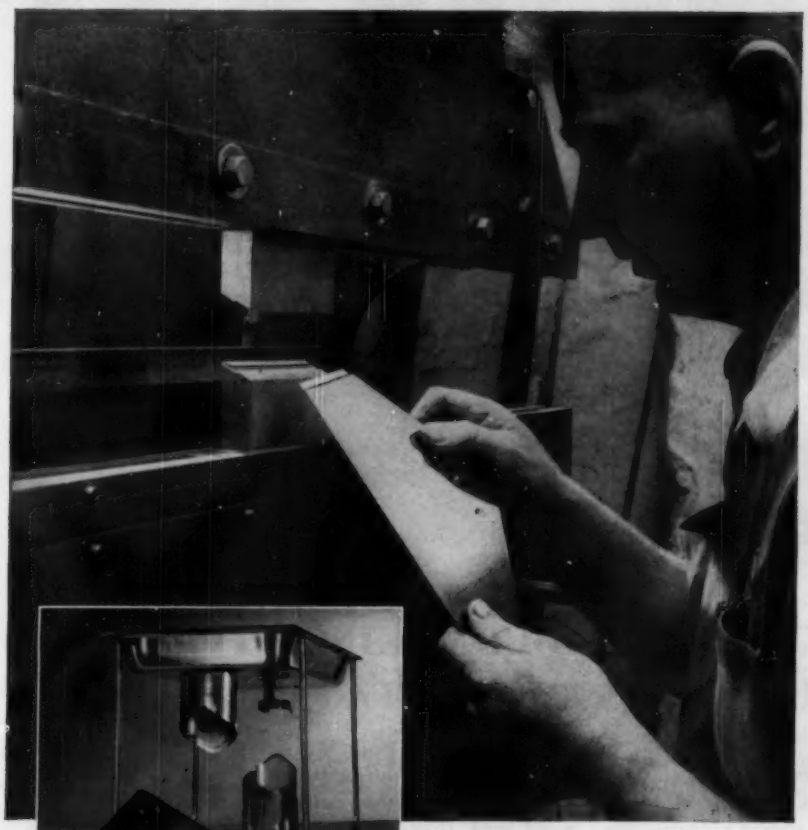
D.O.JAMES GEAR MFG. CO.
1140 W. Monroe Street, Chicago — Branches in Key Industrial Areas

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation



Brake Die saves shop time in forming overlap for steel spout

The problem sounded simple enough — putting an overlap in a section of 20-gage stainless steel, which was then formed into a spout for use in meat-packaging tables. But getting a tool steel which could do the job more economically than the grade formerly used was somewhat of a challenge for the manufacturer, J. B. Dove & Sons, Inc., Philadelphia.

The answer was Bethlehem Brake Die, supplied by our local tool steel distributor, Hill-Chase & Co. Because of Brake Die's easy machinability and good wear-resistance, the new die minimized manufacturing costs. It also helped in producing a better-looking product. Said one of the Dove engineers: "We like Brake Die. It's doing a good job for us."

Brake Die, a special alloy steel, is oil-quenched and tempered to develop a fine balance of mechanical properties. It's ideal where wear-resistance, toughness, resistance to impact and good machinability are required.

Typical Analysis

Carbon 0.50	Manganese 0.90
Chromium 1.00	Molybdenum 0.20

Chances are there might be one or more applications in your shop right now where Brake Die steel could be used to good advantage. Why not talk it over with your Bethlehem tool steel distributor?

BETHLEHEM TOOL STEEL ENGINEER SAYS:

How to Shrink-Fit Tool Inserts

Shrink-fitting of tool steel inserts is a procedure which is being widely used to improve the service life of tools. Shrink-fitting is most applicable to rings and cylinders, such as are used in heading and drawing operations where the tools can be shrink-fitted into large retaining rings. The shrink-fit sets up radial compressive stress in the tool, which is available to oppose radial tensile stress set up in service, and thereby improves the performance as compared to solid tools which are not pre-stressed. Shrink-fitting of tools should be carried out as follows:

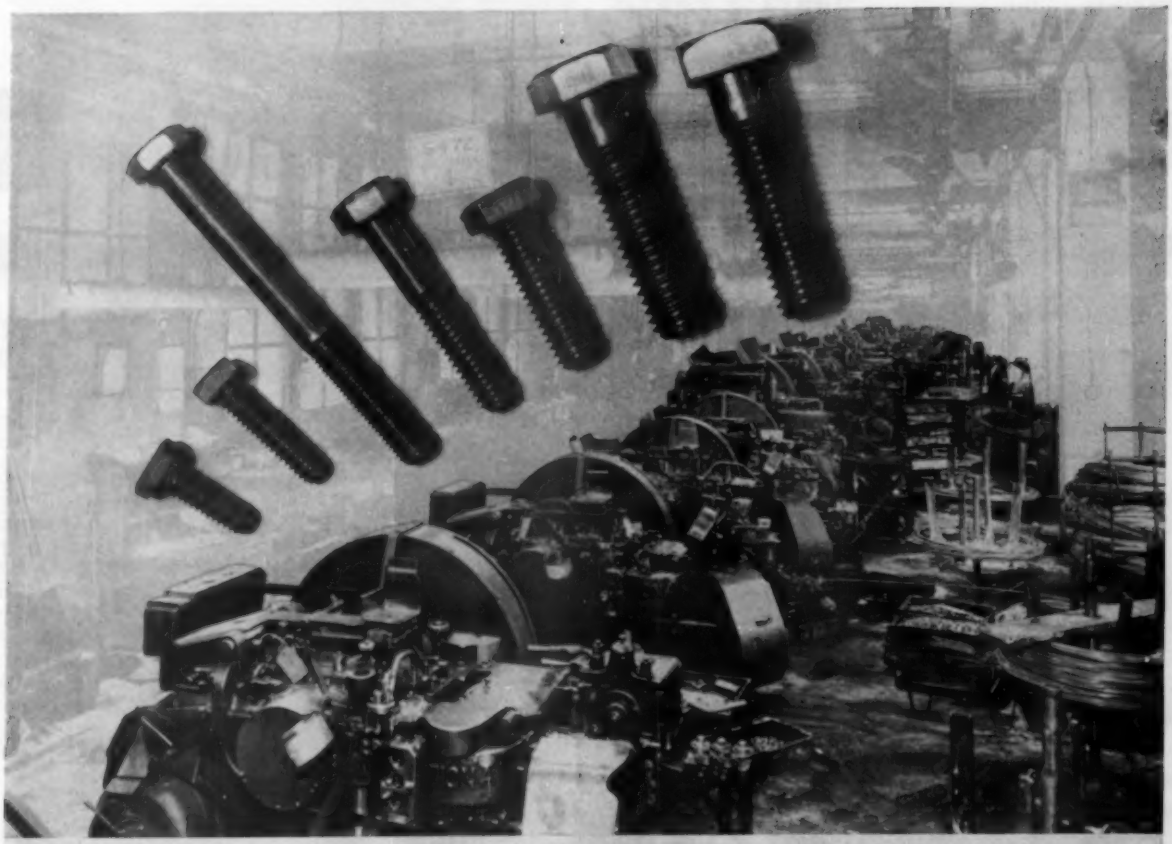
1. The retainer must be of adequate diameter and strength to provide the stresses required on the tool insert. This generally means that an alloy steel capable of hardening to approximately 300/400 BHN must be used. Shock-resisting tool steels heat treated to approximately Rockwell C 48 to 52 are used on heavy duty applications. It is recommended that the OD of the retainer be a minimum of twice the ID (preferably three times the ID).

2. A shrink-fit allowance of .003/.004 in. per in. should be provided for. This means that the OD of the insert is .003/.004 in. per in. larger than the ID of the retainer into which it must fit. These dimensions must be carefully maintained in order to obtain the benefits of shrink-fitting.

3. The OD of the insert and the ID of the retainer should have a smooth finish, preferably produced by grinding.

4. The retainer should be heated to a temperature sufficient to cause the expansion necessary to assemble the insert. Care should be exercised not to exceed the tempering temperature used in heat-treating the retainer. If necessary, the insert may be sub-zero cooled to aid in providing the clearance required for assembly.

5. After assembly of the parts, cooling of the assembly should be rapid enough to prevent over-tempering of the insert by heat transferred from the retainer.



AUTOMATIC BOLT MAKING AT NATIONAL SCREW AND MANUFACTURING CO.

The National Screw and Manufacturing Company, Cleveland, Ohio, one of America's oldest manufacturers of fasteners, relies on NATIONAL Boltmakers for fast, efficient bolt production.

The above photograph shows one battery of fifteen NATIONAL Boltmakers producing bolts ranging in size from 3/16" up to 1/2" in diameter at National Screw's Cleveland plant.

NATIONAL Boltmakers cut steel rod to proper length, extrude the blank, head, trim the head, point the end and roll the threads, *all automatically!* Grain flow in the head and threads is symmetrical and unbroken. The part is stronger because the cold-forging action increases fatigue resistance and tensile strength.

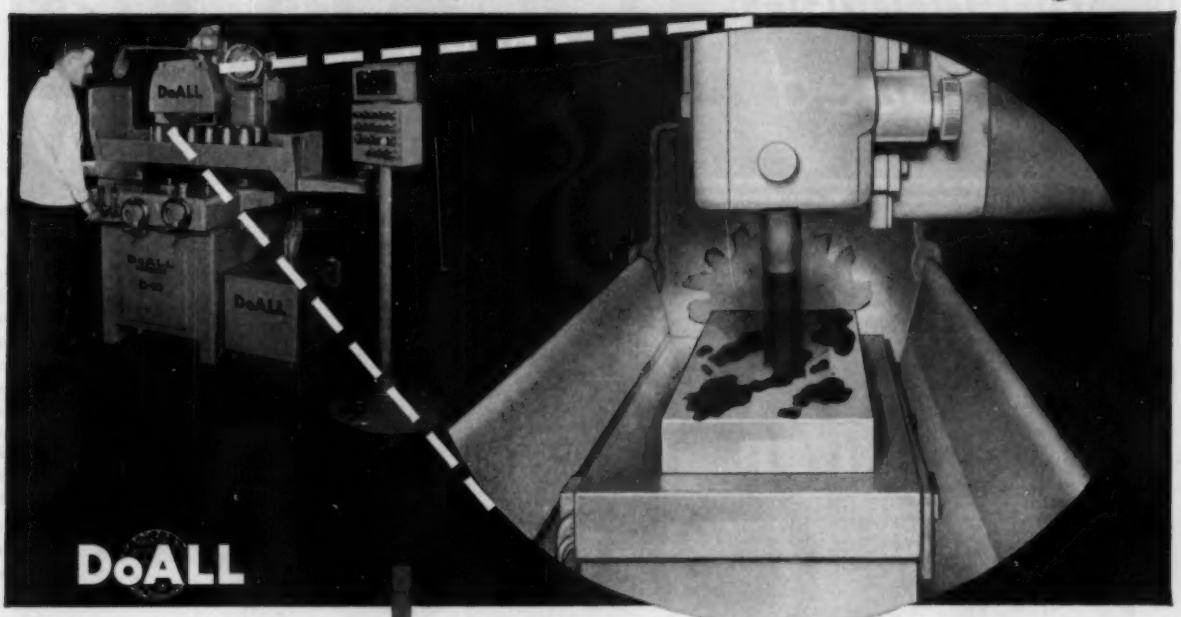
You are cordially invited to visit our plant to investigate how NATIONAL hot- and cold-process machinery can bring you fast, automatic production of your forged metal fasteners and components. No obligation.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO — SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

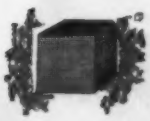
Hartford Detroit Chicago

"Cool Grinding" Proves 1000 Times More Effective than Flood Cooling



Mist Provides 1000 Times More Heat Absorbing Surface

A cubic inch of coolant offers six square inches of heat absorbing surface.



Atomized, each of the 1,000,000,000 cubes offers .000006 square inches of surface or total of *6,000 square inches* over all.

In "COOL GRINDING" coolant is fed to the sides of the wheel. Centrifugal pump action draws the coolant into and through the wheel. It emerges atomized, right at cutting edge.

Grind Faster, Grind Accurately, More Confidently

Atomized coolant, as shown at left, is 1000 times more effective as a heat absorbent than liquid coolant. "Cool Grinding" puts this atomized coolant directly at the point of work-wheel contact. Temperatures are reduced as much as 1300°F as compared to flood cooling.

Aids Precision in Grinding—Efficient heat dissipation prevents expansion—helps assure close control of dimension and parallelism.

Ground Parts Last Longer—"Cool Grinding" eliminates burning, checking and stresses—a source of premature failure of ground parts resulting from high heats and quick quenching.

Increased Production—Grinding can be done at faster rates, without heat expansion or damage.

Dry Grinding Visibility—Mist does not obscure work, visibility is unlimited.

Wheel Life Increased—Continuous flushing and cooling action *in* the wheel greatly increases its life.

Standard Grinding Wheels—No need for wheels with "special" arbor holes.

Coolant Recirculates—Saves on coolant. Special filter cleans the coolant before reuse.

Free In-Your-Plant Demonstration—DoALL will bring a grinder to your plant and show you how to increase your grinding profits. Write: **The DoALL Company, Des Plaines, Illinois**

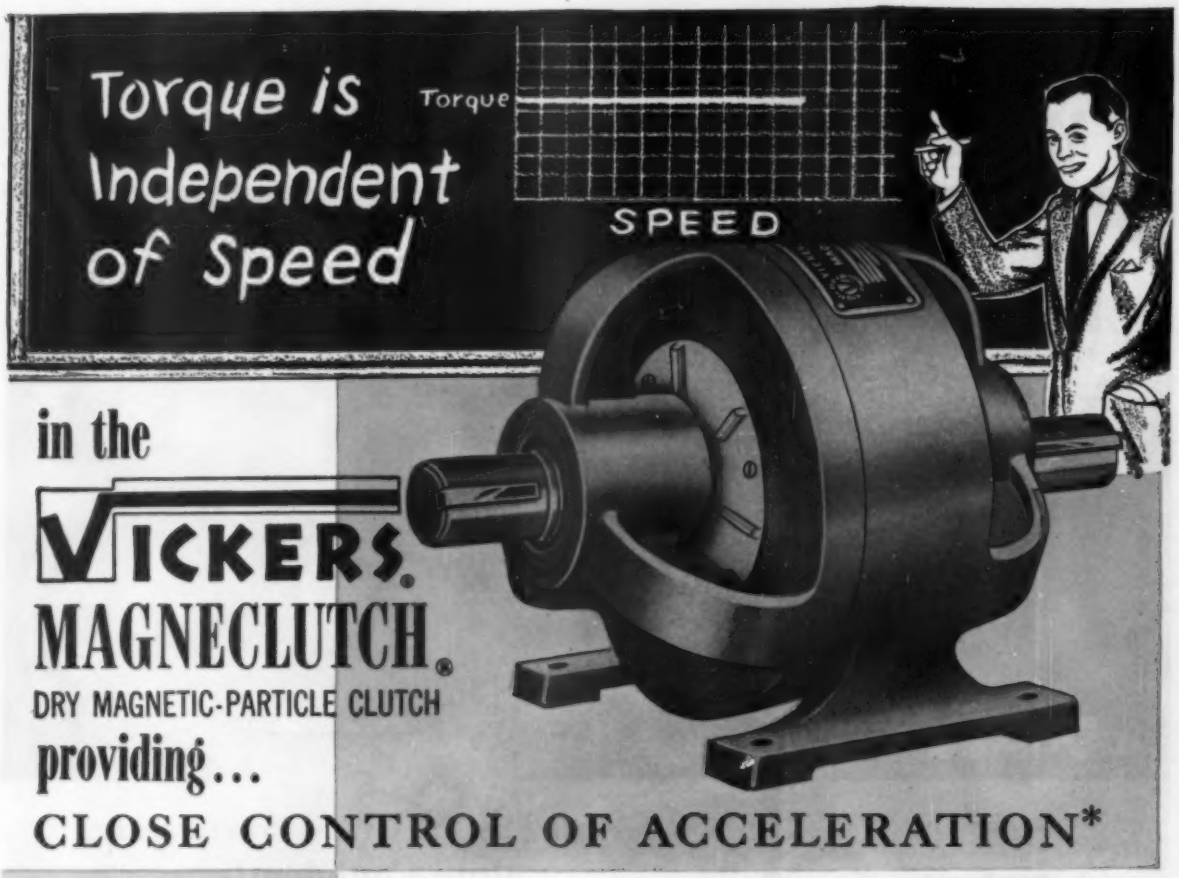
FREE MOVIES—Sound and color to show you the ultimate in precision grinding. Call DoALL locally or write.

FREE CATALOG—Shows design and construction of DoALL Grinders and accessories including "Cool Grinding".

Friendly DoALL Sales-Service Stores In 38 Cities.

Cool Grinding U.S. Pat. No. 2470350

THIS IS A TYPICAL DoALL STORE

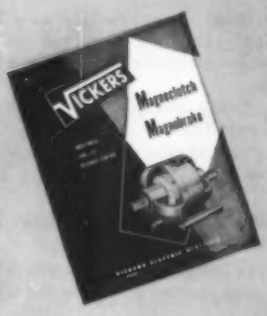


in the VICKERS® MAGNECLUTCH®

DRY MAGNETIC-PARTICLE CLUTCH

providing...

CLOSE CONTROL OF ACCELERATION*



Vickers MAGNECLUTCH may also be used for braking and tension control. Get the complete facts. Write today for bulletin and application data forms.

IN the Vickers MAGNECLUTCH, torque is transmitted through the linking action of magnetized ferromagnetic particles in the gap between driving and driven members. The amount of torque transmitted is regulated by varying the amount of energizing current, and is independent of the rotational speed of the driving and driven members. This torque transmission principle permits extremely close control of acceleration.

VICKERS MAGNECLUTCH

Also Offers These Other Outstanding Advantages

SMOOTH OPERATION
LONG LIFE, *because there's no wear on torque transmitting surfaces*
TORQUE AT ZERO SLIP—*torque transmitted with 100% mechanical efficiency*
EXTREMELY FAST RESPONSE
SMALL CONTROL POWER
EASILY ADAPTED TO REMOTE CONTROL

*Equally close control of deceleration may be obtained with Vickers MAGNEBRAKES.

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VICKERS INCORPORATED

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M & M develops another specialized machine

New automatic inline transfer machine

handles 650 pistons per hour at 100% efficiency

Pistons are delivered to the first station of machine by a conveyor. They are picked off this conveyor, loaded into the machine, processed and delivered to another conveyor . . . all automatically. Here is the sequence of operations performed:

Station 1—Accept and unload piston from conveyor chute.

Station 2—Orient piston in relation to pin bores and bosses, using an electric eye and orientating table.

Station 3—Push piston down against positive locator by means of hydraulic expanding lug. Drill center of dome end and spot face two sections from the bottom upwards.

Station 4—Mill weight pads.

Station 5—Spot drill drive holes in weight pads.

Station 6—Drill drive holes in weight pads.

Station 7—Ream drive holes in weight pads.

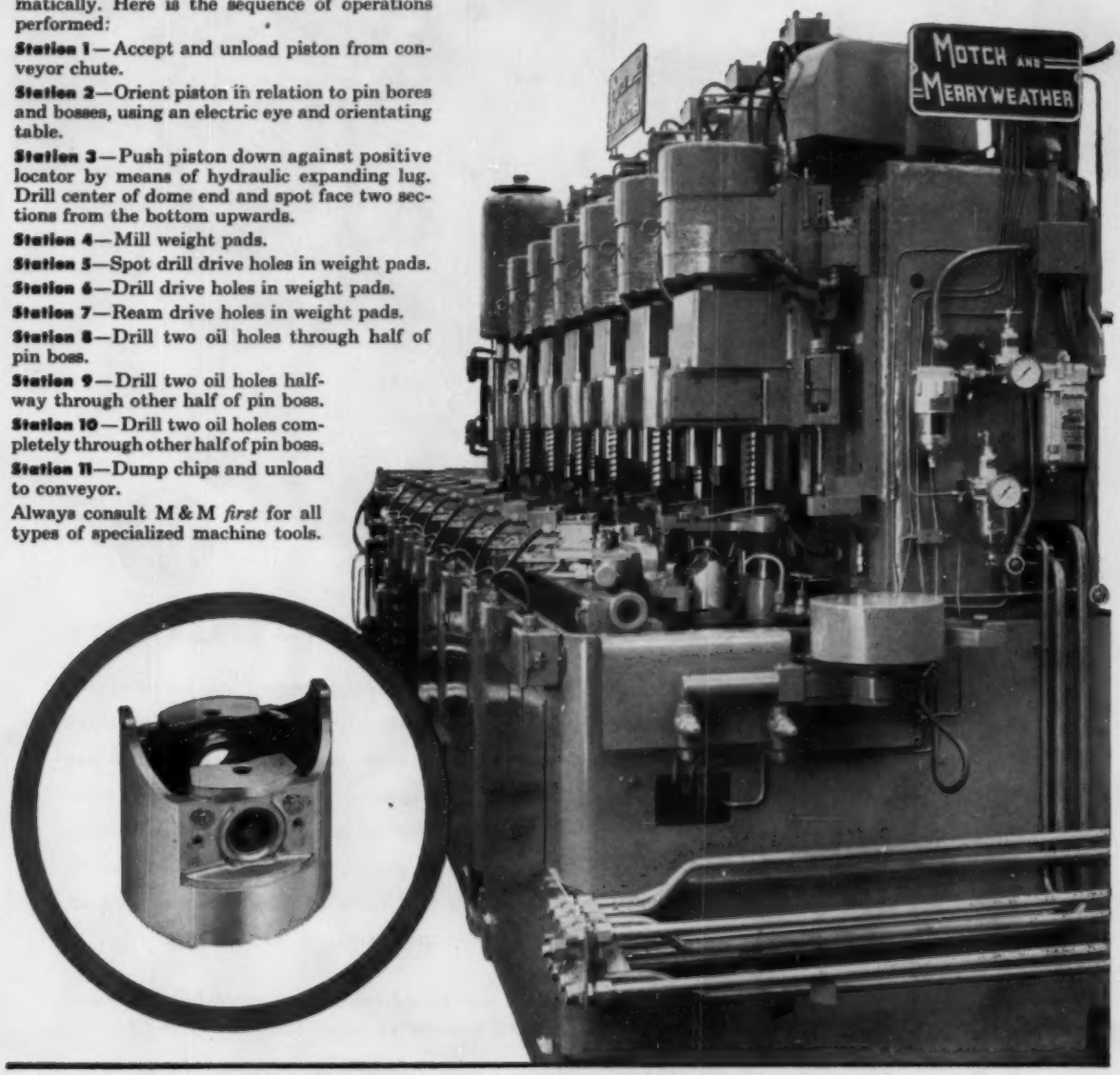
Station 8—Drill two oil holes through half of pin boss.

Station 9—Drill two oil holes halfway through other half of pin boss.

Station 10—Drill two oil holes completely through other half of pin boss.

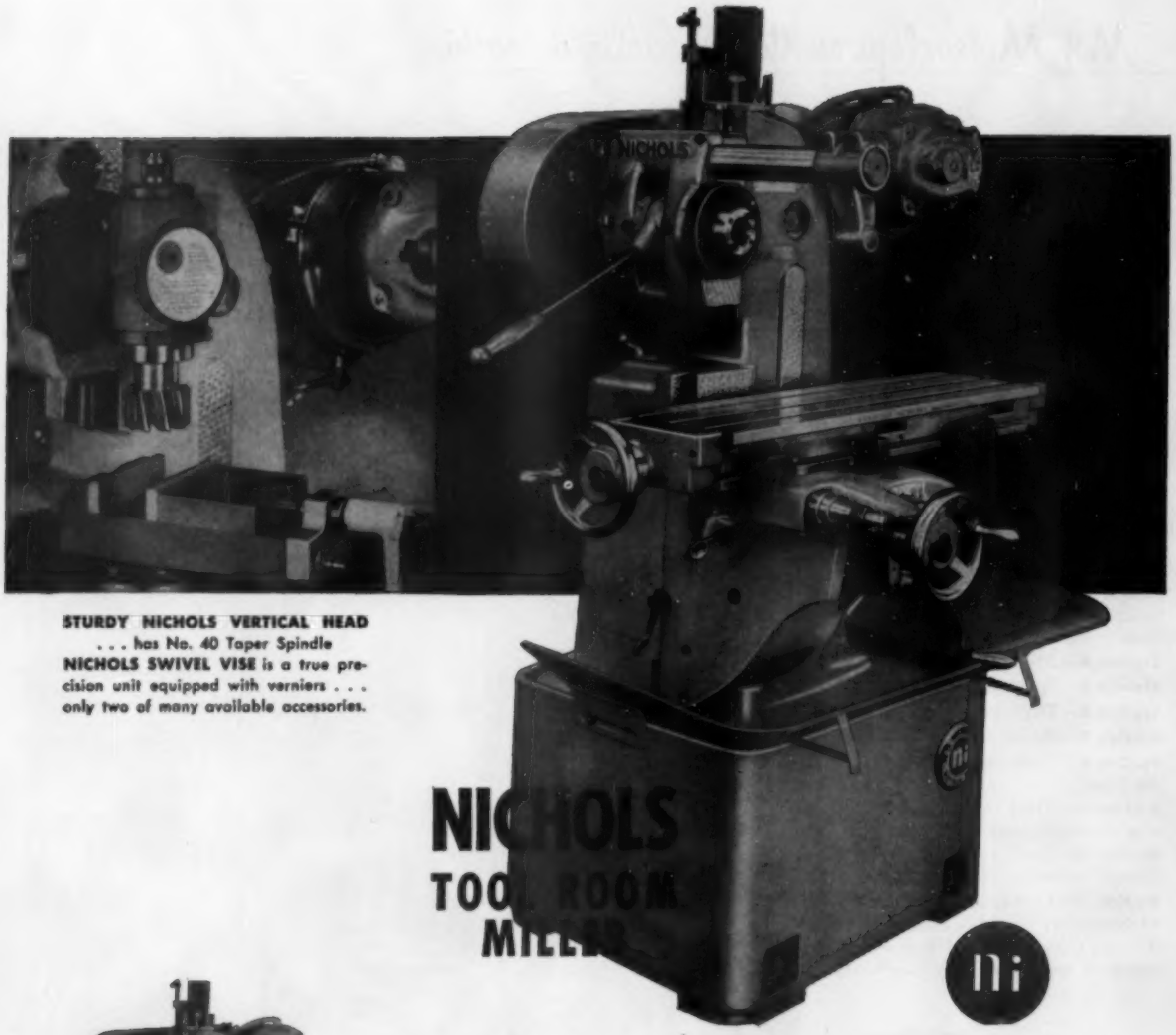
Station 11—Dump chips and unload to conveyor.

Always consult M & M *first* for all types of specialized machine tools.



The MOTCH & MERRYWEATHER MACHINERY Company

MACHINE TOOL MFG. DIVISION
CLEVELAND, OHIO



STURDY NICHOLS VERTICAL HEAD . . . has No. 40 Taper Spindle **NICHOLS SWIVEL VISE** is a true precision unit equipped with verniers . . . only two of many available accessories.

NICHOLS TOOL ROOM MILLER

ni

STANDARD MODEL—A precise, versatile Hand Miller with Rise and Fall spindle. Table size 6¾" x 21"

ACCURACY—SENSITIVITY—VERSATILITY

Gives the tool room what it demands—a compact, rugged miller with extreme accuracy and utmost flexibility. The Nichols TOOL ROOM MILLER is arranged for sensitive hand screw feed, has generous table surface—8½" x 30" with 19" longitudinal travel. Precision feed screws have oversize, *easy reading* micrometer dials. Large hand wheels provide element of "feel" so important in precision milling. Rise-and-Fall Spindle simplifies set-ups. Lever table feed, furnished *in addition to* screw feed, increases usefulness. Selective speed ranges up to 5000 RPM.

2 educational 16 mm sound color films available for free showing—send for descriptive letter and reservation form.

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STARRETT PRECISION MAKES GOOD PRODUCTS BETTER

Features pioneered by Starrett include:
• Balanced Design
• Satin Chrome Finish
• One-piece spindle construction
• Hardened and ground threads
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STARRETT MICROMETER CALIPERS

for guaranteed accuracy, longer life, lower costs

In buying a micrometer, utmost reliability is the first consideration. The name Starrett, representing more than 75 years of specialized know-how in micrometer manufacture, is the best guarantee of quality and precision.

All Starrett micrometers offer the above features that insure better, faster precision measuring with lasting accuracy . . . the only safe way to reduce tool costs and lower production costs.

Starrett Satin Chrome Micrometer Calipers are made in a complete range of styles and sizes from ½ to 168 inches in full finish and black frame types . . . also tubular micrometers, inside micrometer calipers, micrometer depth gages and a wide variety of special purpose micrometers.

Your Industrial Supply Distributor can furnish the right Starrett micrometers for your precision measuring needs. Call him for quality products, dependable service. Or send for the big new Starrett Catalog which illustrates the complete line. Address Dept. "C" The L. S. Starrett Company, Athol, Massachusetts, U. S. A.

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World's Greatest Toolmakers

PRECISION TOOLS • DIAL INDICATORS • STEEL TAPES • GROUND FLAT STOCK • HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

39th National Metal Exposition

Thousands of products will be displayed by more than 500 metalworking firms in the vast exhibit areas of Chicago's International Amphitheatre and Exposition Hall, Monday through Friday, November 4 to 8. 50,000 experts from the United Statees and the free world will meet with you.

2nd World Metallurgical Congress

Years of intensive effort have gone into this world event. Overseas scientists and engineers will attend from 38 countries of the free world. They will exchange ideas with you, present their own technical and practical papers.

You will want to be in Chicago the week of November 4.

You will want to hear these scientists and engineers from the whole, wide wonderful world of metals . . . outstanding metal men from the United States, Canada and the entire free world . . . more than 38 countries will be represented. You will want to listen, to discuss, to meet the men who are creating this world of metals.

You will want to be in Chicago to see the vast array of metalworking products and equipment that will be displayed by more than 500 leading firms at the Metal Show — the 39th National Metal Exposition — in the International Amphitheatre and Exposition Hall. This will be the greatest display of metals and metalworking equipment. Here, in one week, you will see more products, talk with more metalworking experts, than in a year of travel.

Exhibit Space Available

Hundreds of manufacturers have reserved Metal Show space, but there are good locations still available in the vast new exposition halls of the International Amphitheatre. If the metalproducing or metalworking industries are your market, don't miss this show — write for display information now.

You will want to be in Chicago with your associates from management, engineering, production and sales. This will be a world event you will long remember — and from which you will obtain ideas and knowledge to meet the metalworking problems of today and tomorrow. Make a date now — to be in Chicago, the week of November 4. For hotel reservations write: Metal Show Housing Bureau, c/o Chicago Convention Bureau, Inc. 134 N. LaSalle Street, Suite 900, Chicago 2, Illinois.

Cooperating Societies: Metals Division, American Institute of Mining, Metallurgical and Petroleum Engineers . . . the Society for Non Destructive Testing . . . the Industrial Heating Equipment Association.

AMERICAN SOCIETY FOR METALS

The Engineering Society for the Metal Industry

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Brown & Sharpe–NELCO and Your Distributor

A Tremendous Tooling Team!

. . . stocks the tools you need now . . . High Speed Steel and Carbide Too!

Yes, all Brown & Sharpe-NELCO Distributors stock. Service on over 3000 "standards," the world's largest line of milling cutters . . . just around the corner from EVERYWHERE in Metalworking America!

Now . . . Solid Carbide, Carbide Tipped and High Speed Steel tooling recommendations and service to progressive industries that can't afford wait, worry, waste or downtime!

In every way . . . your Brown & Sharpe-NELCO Distributor saves you TIME . . . MONEY . . . PRODUCTION HEADACHES. Have his tremendous Tooling Team on your production team . . .

CALL HIM TODAY!

Brown & Sharpe

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NELCO TOOLS

MANCHESTER, CONNECTICUT

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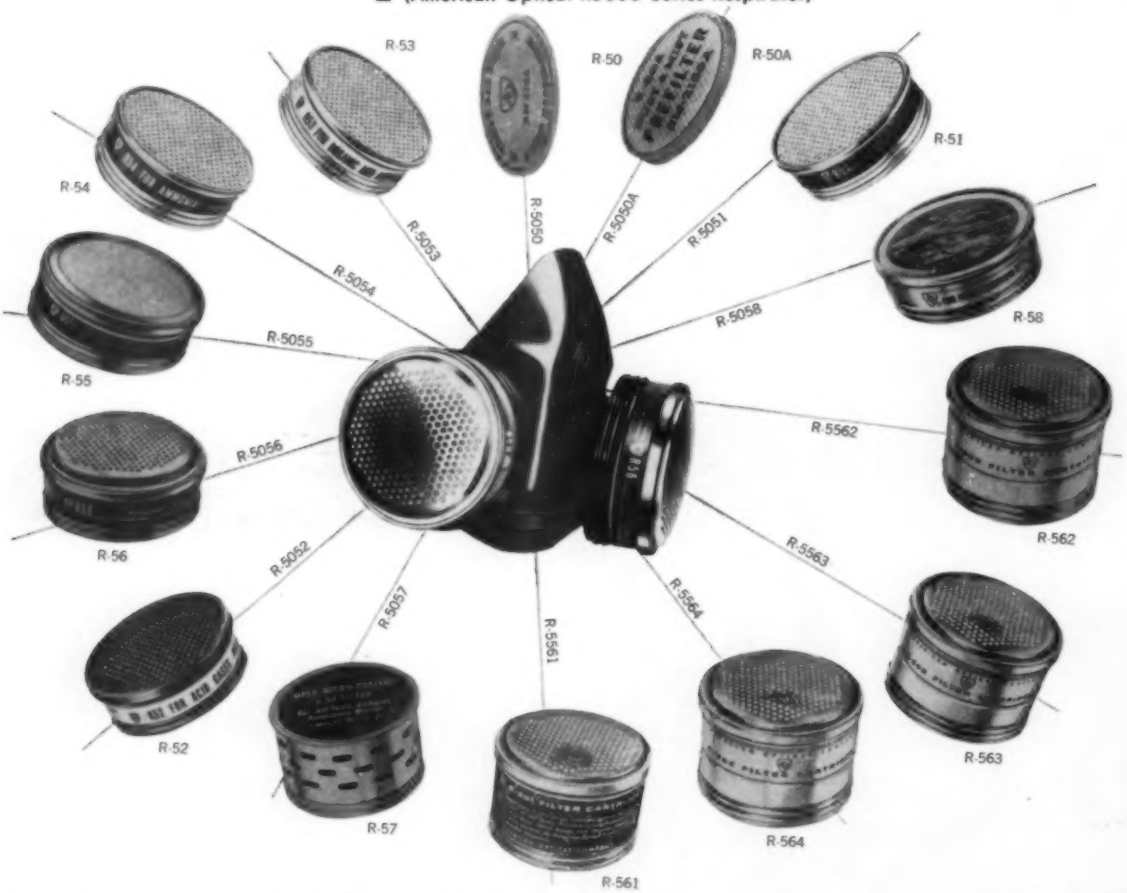
For that EXTRA Edge in Production

R5000 Series Respirator

Solve Respiratory Problems Simply with

14 Respirators in One

(American Optical R5000 Series Respirator)



If your plant has two to fourteen respiratory hazards you *don't* have to buy two to fourteen different respirators! The AO R-5000 Series will give you quality protection against a multitude* of dust, mist, fume, and gas hazards (singly or in combination) at the cost of *just one* basic face piece and the necessary cartridges and filters. Quick interchangeability does it!

*Nuisance, toxic and pneumoconiosis-producing dusts, acid gases, organic vapors, alkali gases, metal fumes, radioactive particulate matter, pneumoconiosis-producing mists and ammonia.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

Always insist on Trademarked Safety Products. Your nearest American Optical Safety Products Representative can supply you.

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MULTIPRESS

boosts carbon core production 33%

at CLEVELAND GRAPHITE BRONZE

Cleveland Graphite Bronze has increased the production of soft carbon cores for aircraft bearing castings by 33% using a 25-ton Denison hydraulic Multipress.

Machining cores to shape, the best alternative method, can be done at the rate of 70-75 per hour. With Multipress, 100 cores are formed in the same period. Soft carbon at one-tenth the cost can be used instead of the hard carbon required in a machining operation.

Datalog COM-3 describes this operation in detail.
For your copy, write Denison Engineering Division, American Brake Shoe Co., 1164 Dublin Road, Columbus 16, Ohio.

DENISON HydrOILics

HYDRAULIC PRESSES • PUMPS
MOTORS • CONTROLS

Hydraulic ram on 25-ton Multipress descends to press carbon into core form in the first stage of two-part operation.

Plug is removed from soft carbon core after stripping operation at Cleveland Graphite Bronze.

Denison, Denison HydrOILics, and Multipress are registered trademarks of Denison Eng. Div., ABSCO

You can expand your plant,

for production men

This Avey machine drills various patterns of holes in jet engine parts by changing program drums or by alternating two automatically-driven locators which position the table accurately from a radial position. Program drum also programs one or more of the four drilling units for drilling, reaming, and similar operations.

The machine consists entirely of standard Avey units: four Aveydraulic automatic units with 12″ feed; cast iron columns; 120″ fan type steel base; 60″ Electrodex table. Top column and unit have an in-and-out traverse of 20″. The ways are mounted on steel adaptor blocks which can be removed for different heights.

All units and the index table are push button-controlled.

If you're looking for flexibility in a special machine, your Avey man's the man to see.

for management

The pressure to expand is terrific on managements who want to be prepared for the rocketing market growth predicted for the next 10 years. They realize that they will probably lose ground by standing still, but they also want to protect their balance sheets, and their peace of mind, from heavy debt due to adding costly plant space.

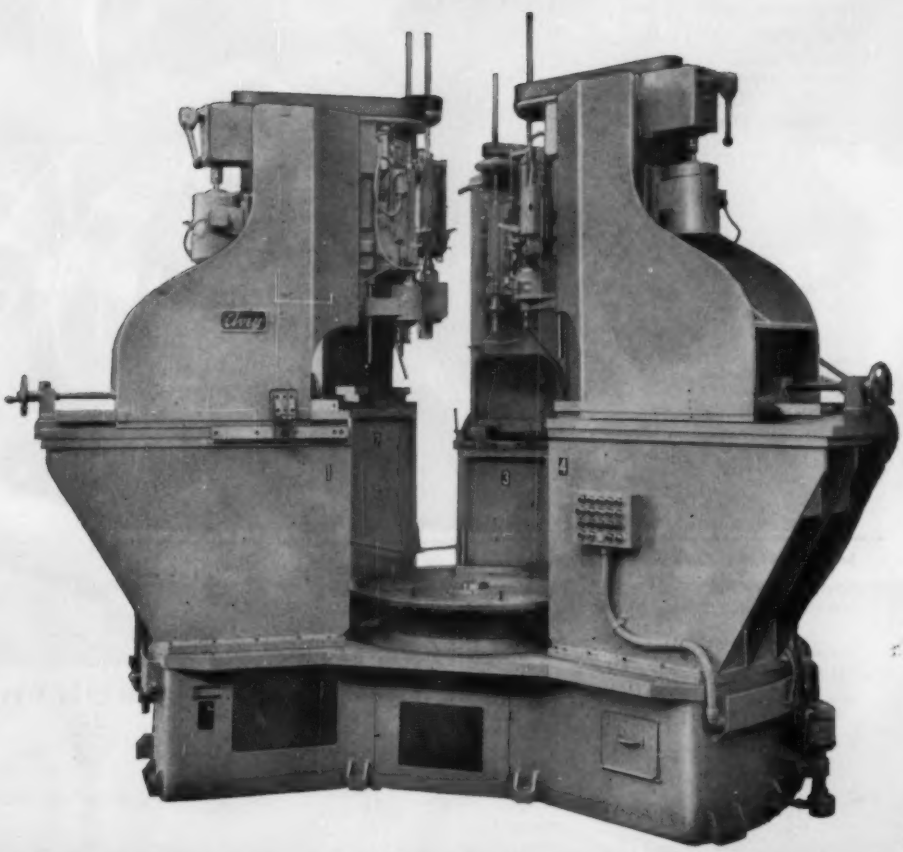
Avey production machines offer a quick and economical means of achieving the primary objective of expansion: increased productive capacity. They concentrate many operations in a comparatively small area, and free both floor space and labor for other productive operations. Their production rate enables you to increase your sales volume; and their fast pay-off rate gives you substantial earnings on your investment in a short time. Their unitized construction permits economical re-engineering to handle new parts or design changes.

AVEY DIVISION, THE MOTCH & MERRYWEATHER MACHINERY CO., BOX 625 CINCINNATI 1, OHIO

drilling, tapping, production machines

and sleep well too

Avey

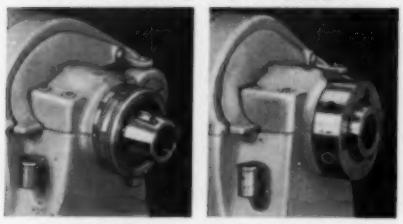


ACCURACY
to keep machining economical

SOUTH BEND 14½" LATHES

Tolerances don't dictate slow-ups when you are using these precision lathes. Their accuracy, smoothness and operating ease save time as well as material on the tough jobs. With proper tooling, work can often be machined with such precision and smoothness that subsequent grinding, honing or lapping operations may be eliminated. Dollar-for-dollar you get more in South Bend Lathes. Write for catalog now and find out how South Bend Lathes can lower your machining costs.

OPTIONAL FEATURES



Cam Lock or Long Taper Key Drive Spindles to provide greater interchangeability of chucks, collets and fixtures.

Hardened—Ground Bed Ways to resist wear and scoring under severe conditions.

SPECIFICATIONS

SWING: 14⅛" over bed and saddle wings.

DISTANCES BETWEEN CENTERS: 24½" to 60½".

COLLET CAPACITY: 1" max. (collets interchangeable with all South Bend 10"-1" Collet and larger lathes).

SPINDLE BORE: 1⅜".

SPINDLE SPEEDS: 6, 8, 12 or 16.

LONGITUDINAL, CROSS and THREAD CUTTING FEEDS: 48 each, R.H. or L.H.

BASE PRICE: $1,975 up, f.o.b. factory.

Helpful Handbook How to Run a Lathe, thoroughly covers lathe operation and care. 128 pages. 50c postpaid.

South Bend Lathe, South Bend 22, Indiana

Send literature on ☐ 14½" Lathes, ☐ 9" to 16-24" Lathes, ☐ Turret Lathes, ☐ Milling Machines, ☐ Shapers, ☐ Drill Presses, ☐ Pedestal Grinders.

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Up to 24 months to pay.

SOUTH BEND 22, INDIANA

Building Better Tools Since 1906

A NEW STANDARD IN CUTTING PERFORMANCE

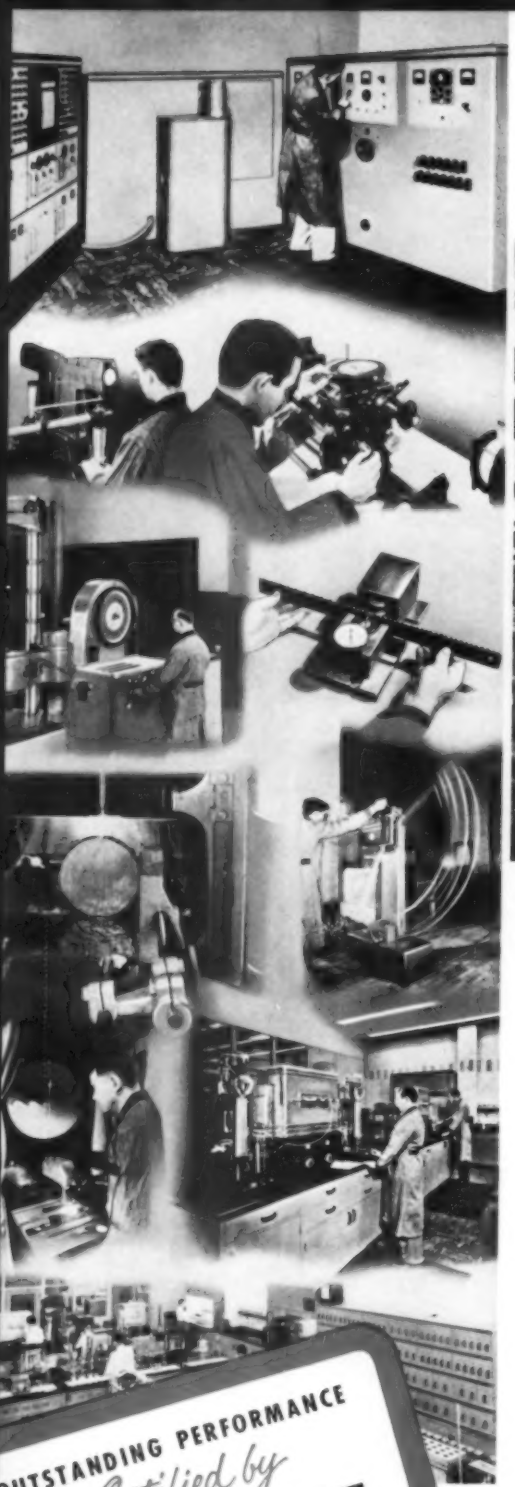
LADISH

Controlled Quality

HIGH-SPEED STEEL

POWER HACK SAW BLADES

- *Developed and manufactured by one of the largest users of power hack saw blades.*
- *Unsurpassed metallurgical and manufacturing controls assure cutting performance.*



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Certified by
LADISH

UNEQUALLED METALLURGICAL AND MANUFACTURING CONTROLS

LADISH

THE BLADE BACKED BY OVER A MILLION TONS OF STEEL AND HIGH DENSITY ALLOY SAWING EXPERIENCE

Through every phase of production . . . from receipt of Ladish special blade quality material to packaging for shipment . . . exacting manufacturing controls and scientific laboratory procedures safeguard uniformity in quality, cutting performance and metallurgical integrity of every Ladish blade.

THE ONE BLADE THAT GIVES EXTRA PROTECTION OF HEAT CODE IDENTITY

Each mill heat of steel used in the manufacture of Ladish blades is subjected to exhaustive chemical analyses and physical tests to verify compliance with the high standards of Ladish specifications. A heat code symbol is then assigned to identify this material through all phases of production.

The distinctive heat code symbol on each Ladish blade is the key to its metallurgical integrity . . . another added assurance of dependable performance.

Controlled Quality

POWER HACK SAW BLADES... *a significant advance in cutting metals*

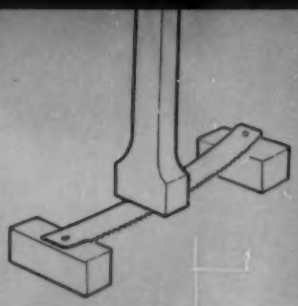
Now, after years of exhaustive production testing, Ladish, one of the largest users of power hack saw blades, announces the development and manufacture of Ladish Controlled Quality power hack saw blades... blades that in long range, exhaustive tests have earned significant recognition as... *a new standard in cutting performance.*

This blade development is a direct result of valuable performance data tabulated in the process of cutting over a million tons of steel in a wide variety of sizes, shapes and material specifications including stainless steels, alloy steels, titanium and high density heat-resisting materials.

With this vast experience Ladish engineers designed, developed and tested a blade with the necessary qualifications to provide assurance of long, trouble-free service in making fast, straight cuts.

BALANCED HARDNESS AND TOUGHNESS ASSURE MAXIMUM SERVICE

Ladish heat treating techniques, selection of blade stock and manufacturing processes provide proper balance of toughness and hardness to give long life, rapid and straight cutting.

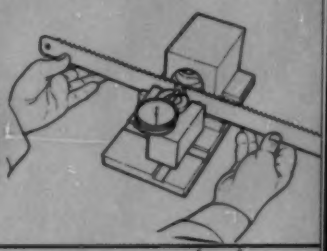


TOUGH PIN HOLE AREA RESISTS WEAR AND BREAKAGE AT CRITICAL LOCATION

Tough pin hole area... increases resistance to breakage. Each blade individually Rockwelled for conformity to specified hardness rating.

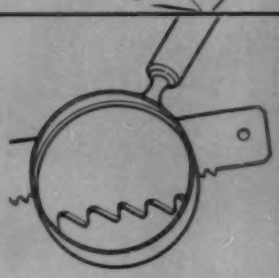
PRECISION MILLED AND SET CUTTING TEETH

Special machine tools, designed and produced by Ladish, precision mill teeth to honed sharpness. Teeth set to consistent uniform gage measure.



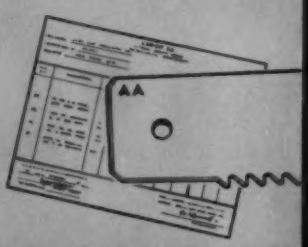
SCIENTIFIC TOOTH PROFILE CLEARS CHIPS, PREVENTS CLOGGING

Radius in tooth design permits chips to pass freely without causing clogging and binding of blade in cut.



METAL QUALITY CERTIFIED BY SCIENTIFIC LABORATORY TESTS

Each blade bears heat code symbol of its metallurgical integrity.



SUSTAINED HIGH CUTTING PERFORMANCE

LONG, DEPENDABLE BLADE LIFE

MORE CUTS PER DOLLAR

You Can Depend on **LADISH** *Performance Tested Blades*

Prove **TO YOURSELF THE ADDED LIFE AND CUTTING EFFICIENCY OF LADISH BLADES**

Use this coupon to arrange for a consultation with a Ladish Service Engineer.

TO MARK PROGRESS

LADISH CO.

CUDAHY (Milwaukee Suburb) WISCONSIN

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PIPE FITTINGS | DROP FORGINGS | ROLLED RINGS | POWER HACK SAW BLADES

LADISH CO., CUDAHY, WIS.

I am interested in making a personal appraisal of Ladish blades. Have Service Engineer call.

NAME

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STREET ADDRESS

CITY ZONE STATE AM

LADISH *Controlled Quality* POWER HACK SAW BLADES

AMPLE STOCKS ASSURE PROMPT DELIVERY

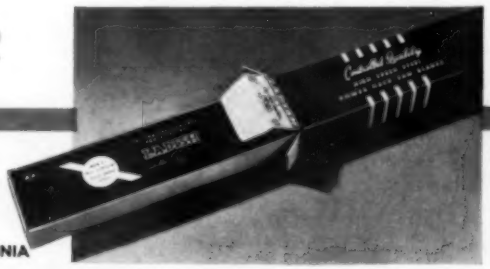
An increasing number of distributors are carrying ample stocks of Ladish blades to meet normal demands.

Unusual requirements can be quickly obtained from the large inventories maintained in the centrally located Ladish plant.

LADISH HIGH-SPEED STEEL BLADE SPECIFICATIONS

NOMINAL SIZE	PIN HOLE DIAMETER	HOLE-TO-HOLE LENGTH	WIDTH	THICKNESS	PART NUMBERS FOR BLADES WITH TEETH PER INCH AS LISTED					WEIGHT IN LBS. PER 100 BLADES
					3 TEETH	4 TEETH	6 TEETH	10 TEETH	14 TEETH	
12	9/32	11⅞	1	.050	...	...	...	1210-5	1214-5	19.2
14	9/32	13½	1	.050	...	...	...	1410-5	1414-5	21.6
			1¼	.062	...	...	1406-6	1410-6	...	34.0
			1½	.075	1403-7	1404-7	1406-7	...	...	48.0
15	9/32	14½	1½	.075	1503-7	1504-7	1506-7	...	...	52.0
17	9/32	16½	1	.050	...	...	...	1710-5	1714-5	26.7
			1¼	.062	...	1704-6	1706-6	1710-6	...	47.9
18	9/32	17½	1¼	.062	...	...	1806-6	1810-6	...	51.4
			1½	.075	1803-7	1804-7	1806-7	...	...	62.2
			1¾	.088	1803-8	1804-8	1806-8	...	...	84.7
19	9/32	18½	1½	.075	1903-7	1904-7	1906-7	...	...	65.2
21	9/32	21	1¾	.088	2103-8	2104-8	2106-8	...	...	100.4
24	9/32	24	1¾	.088	2403-8	2404-8	2406-8	...	...	114.0
	25/64		2	.100	2403-10	2404-10	...	...	...	147.4
30	25/64	30	2½	.100	...	3004-10	...	...	...	230.0

CONVENIENT PACKAGING—
BLADES are packaged in easy-to-handle multiples of 10 blades per carton. Each carton is clearly marked with complete blade identification.



TO MARK PROGRESS

LADISH CO.

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Serving the West...LADISH PACIFIC DIVISION, LADISH CO., LOS ANGELES, CALIFORNIA

Serving Canada...LADISH CO. OF CANADA LTD., BRANTFORD, ONTARIO

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More and more manufacturers apply SIP *Guaranteed* Accuracy to define, establish and maintain high precision in production and measurement to improve quality-of-output and economy-of-operation.

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AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS & MEASURING EQUIPMENT

100 EAST 42nd STREET, NEW YORK 17, N. Y.

new liquid sizing

automatically gauges full length of honed bores

Coolant flow is through the orifices in the honing tool. By incorporating liquid sizing on the tooling, brackets used with other types of sizing have been eliminated.

BarnesdriL honing engineers have developed an improved method for sizing honed bores, as a part of the honing machine cycle. Referred to as Liquid Sizing, this method automatically gauges the diameter of honed bores throughout their full length as honing progresses.

Sizing is accomplished by metering liquid pressure, directed against the cylinder wall through orifices in the honing tool. As honing progresses, the bore increases in size, causing the pressure to decrease. When the pre-selected bore size is indicated over full length of honed bore by the balanced pressure, a limit switch terminates the honing machine cycle, permitting the tool to complete the stroke and withdraw from the bore.

This new BarnesdriL Liquid Sizing method offers the following advantages:

1. Sizing the entire length of bore.
2. Better heat control as a result of directing the flow of coolant through the honing tool orifices to the most critical point.
3. Continual stone flushing, giving longer stone life and better micro finish control.
4. New BarnesdriL Plate Type Honing Tools are utilized.

Contact your BarnesdriL representative for full details on new Liquid Sizing, or write us directly. Years of engineering experience dealing with honing problems enable BarnesdriL engineers to supply the most practical methods and equipment to solve your hole finishing problems.

CUSTOM-HONING SERVICE for special short-run applications. Send us your short-run pieces, with specifications and requirements for prompt honing by expert technicians.

50 years

BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS
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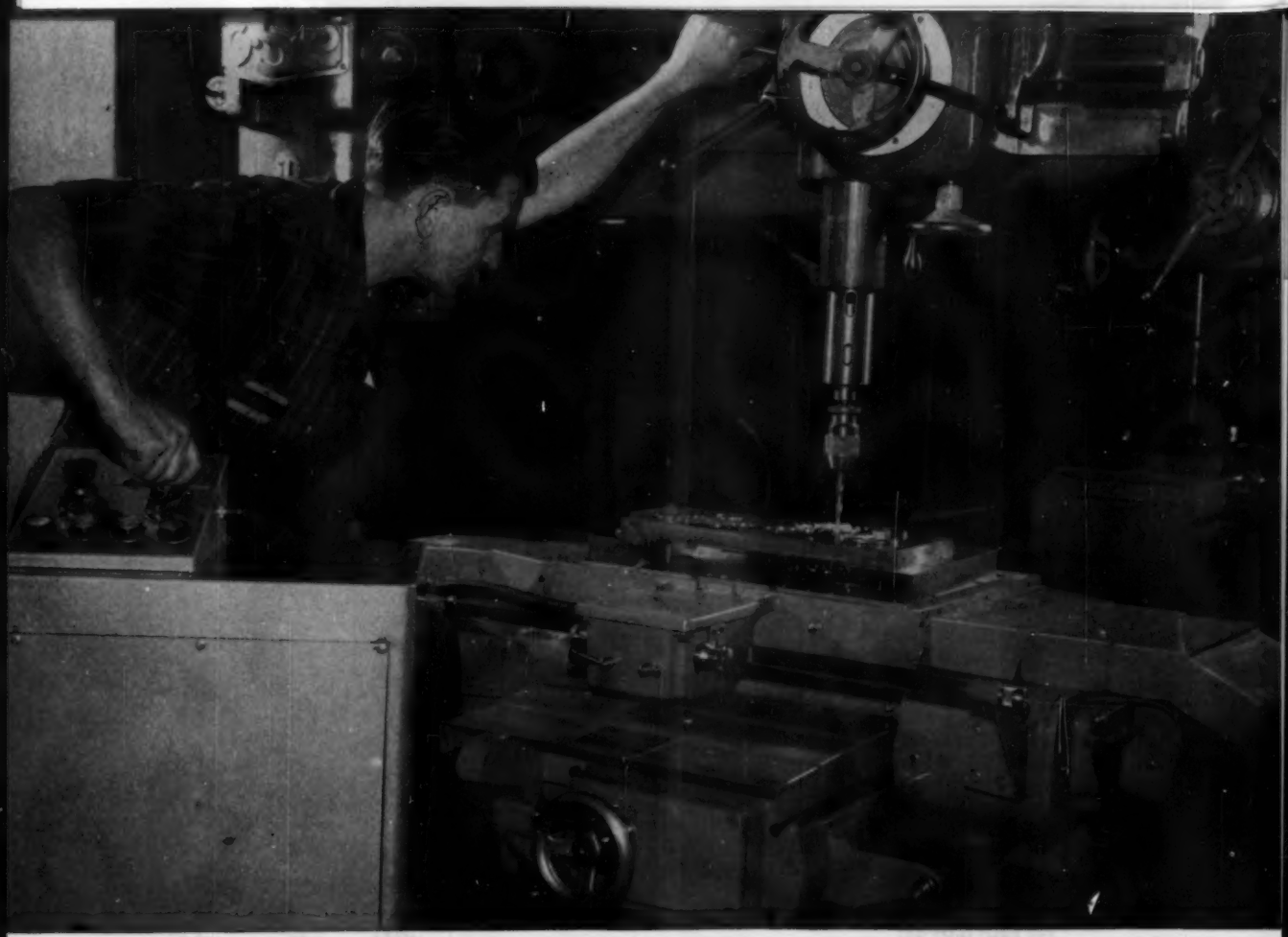

cuts set-up time,
eliminates jigs and fixtures
on repetitive drilling,
reaming, tapping and
many other operations

MICRO-POSITIONER

tape controlled indexing table

The "MICRO-POSITIONER", automatic indexing table, has effected positive accuracy to .001" by providing an external, visual means of adjustment for indentation sensing and tape relocating. Also, an indenter safety switch prevents any possible indenting unless the tape is installed and mechanism is in indenting position. This table is precision made, simple, fully electric and push-button controlled. It makes possible reproduction of complex drill or tapping patterns repetitively and swiftly with very little effort or skill required from the operator. In operation, one tape controls the transverse movements of the work table and a second tape, the longitudinal movements. These movements are controlled electro-magnetically by an electric clutch which makes split second starts and stops of the lead screws as the switches sense the markings on the tapes. It is compact in design and relatively lightweight. Thus, it may be quickly moved from one machine to another as necessary. When used in combination with radial drills, milling machines, turret drills or other suitable spindles, the "Micro-Positioner" results in a universal production machine of unlimited potential.

For complete information, write AM-9

MICRO-POSITIONER DIVISION
710 Wilshire Boulevard, Santa Monica, California
TOPP MANUFACTURING COMPANY

Telephone: EXbrook 4-0373

MOLINE

No. HD68 Special, Multi-Spindle Machine with 81" clearance between columns, drills, reams and chamfers holes in tube sheets of various sizes. Electric control provides means for determining hole pattern through selection of in-line spindles and control of two-way, positive-positioned hydraulic indexing work table.

For Greater...
PRODUCTION • EFFICIENCY • SAVINGS

Use an individually designed "Hole-Hog" Machine Tool for such jobs as:

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- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

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MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

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Representatives in principal cities. 109

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AUTOMATIC LUBRICATION

HELPS YOU
- effect real savings in your own plant
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Hand oiling is costly! It wastes time and money . . . steals valuable production hours . . . means extra down-time, fire risk, repair bills, replacement parts and causes product damage from excess lubricant.

But there's a way to end all this waste and worry. A Bijur Automatic Lubrication System never forgets a bearing . . . bearings never are thirsty for oil, never flooded. Lubrication is continuous, exactly right. All the hazards of hand oiling are banished—*automatically!*

Bijur Systems are custom-engineered for machinery used by practically all industries. Every bearing receives a clean supply of oil at the right time . . . automatically and correctly metered to suit its individual needs . . . while the machine is running! Whether for new equipment you *buy*, or machines you *build*, insist on Bijur. It's better—*by design!* 1038

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Rochelle Park, New Jersey
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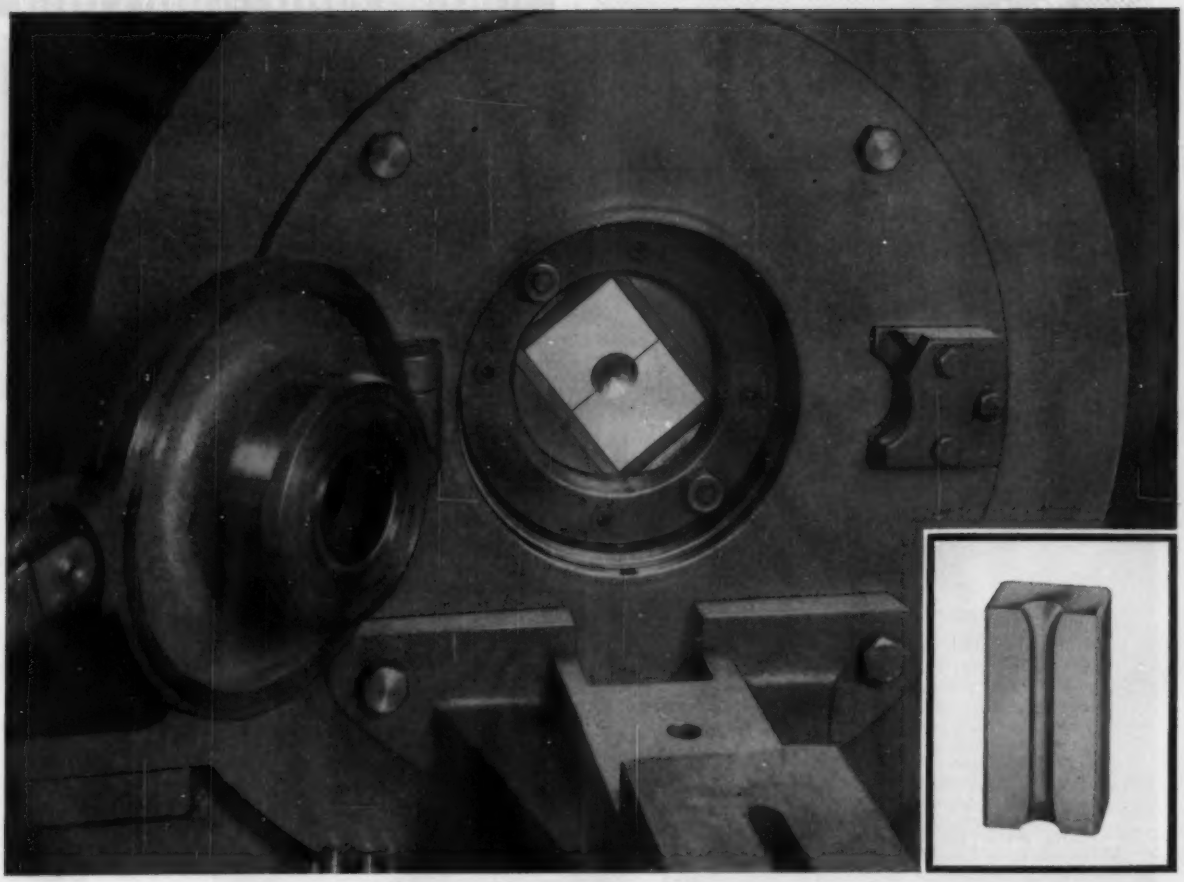

KENNAMETAL* Dies swage up to 50 times more pieces than steel

with more accurate dimensions and better quality

By switching to dies made of Kennametal Grade K90, a manufacturer of hand tools has obtained these important benefits on a hot swaging operation:

- increased production of swaged steel alloy rods from 100 to 1000 pieces between dressings . . . machine down time greatly reduced.
- swaged pieces are now more uniform and of better quality.
- the Kennametal dies are outlasting the steel dies 30 to 50 times.

Although the Kennametal die blocks cost about five times more than the steel dies previously used, they quickly pay for themselves and show substantial profits on the investment.

As Kennametal dies and die sections are showing similar results on many types of operations, why not select Kennametal for your next die parts . . . for blanking, compacting, cold heading, cupping, drawing, forming, perforating, piercing, slitting, stamping or swaging.

You can choose from Kennametal's "90 Series" with six grades or the exclusive non-galling "80 Series" with three grades. These grades provide a range of carbides that meet the specific requirements of any die application.

A Kennametal die engineer will gladly work with you or your die maker in applying the right grade of Kennametal for your dies. Call him at your nearest Kennametal office or write to KENNAMETAL INC., Latrobe, Pennsylvania.

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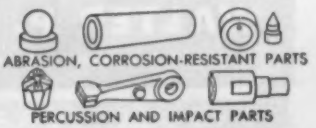
INDUSTRY AND KENNAMETAL ...Partners in Progress



WALTER P. HILL

AUTOMATED DOUBLE-END MACHINES *REALLY CUT COSTS*

New Double-End Machine for Long Parts. Machines both ends of 3/8-in. dia, 15-ft Long Tubing at 4,000 Pieces per Hour.

Hill automated double-end machines produce precision parts at high production rates.

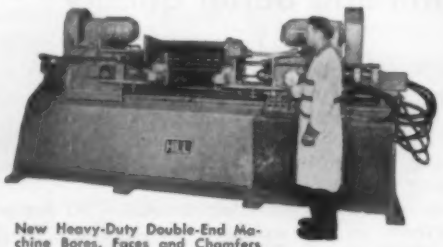
Providing maximum flexibility of part length and diameter, these versatile hydraulic-powered automatic machines utilize magazine feeds. Adjustments for part length changes can be made quickly without altering the magazines.

They will perform precision boring, threading, chamfering, facing and turning operations to 0.001-in. tolerances on solid or tubular round parts. Power heads that develop up to 20-tons thrust force have hollow quills that permit gun drilling at feeds up to 30-ipm with pressurized coolant.

With the head motors stopped, the machines will operate as forming presses that will expand, reduce, flare or bead both ends of tubular parts.

Accurate concentricity of machining and forming operations is assured by boring chucking surfaces with the machine heads.

Send part specifications and production requirements for prompt quotations on cost-saving machines.



New Heavy-Duty Double-End Machine Bores, Faces and Chamfers 30-in. Long, 2-in. dia Steering Columns at 950 Pieces per Hour.

Write for this catalog giving complete information on Hill specialized hydraulic bending machines, double-end machines and extrusion equipment.

WALTER P. HILL

WALTER P. HILL, INC.

22183 Telegraph Road • Detroit 19, Michigan

YESTERDAY'S PIONEER . . . TODAY'S LEADER

WELDON

Stub Length Double-End End Mills

Stock Items

This line of small size end mills, in both double-end and single-end, with flutes shorter than regular, provides the following advantages:

GREATER STRENGTH
LONGER TOOL LIFE
FAR LESS BREAKAGE
FASTER FEEDS

Furnished in 2- and 4-flute styles

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

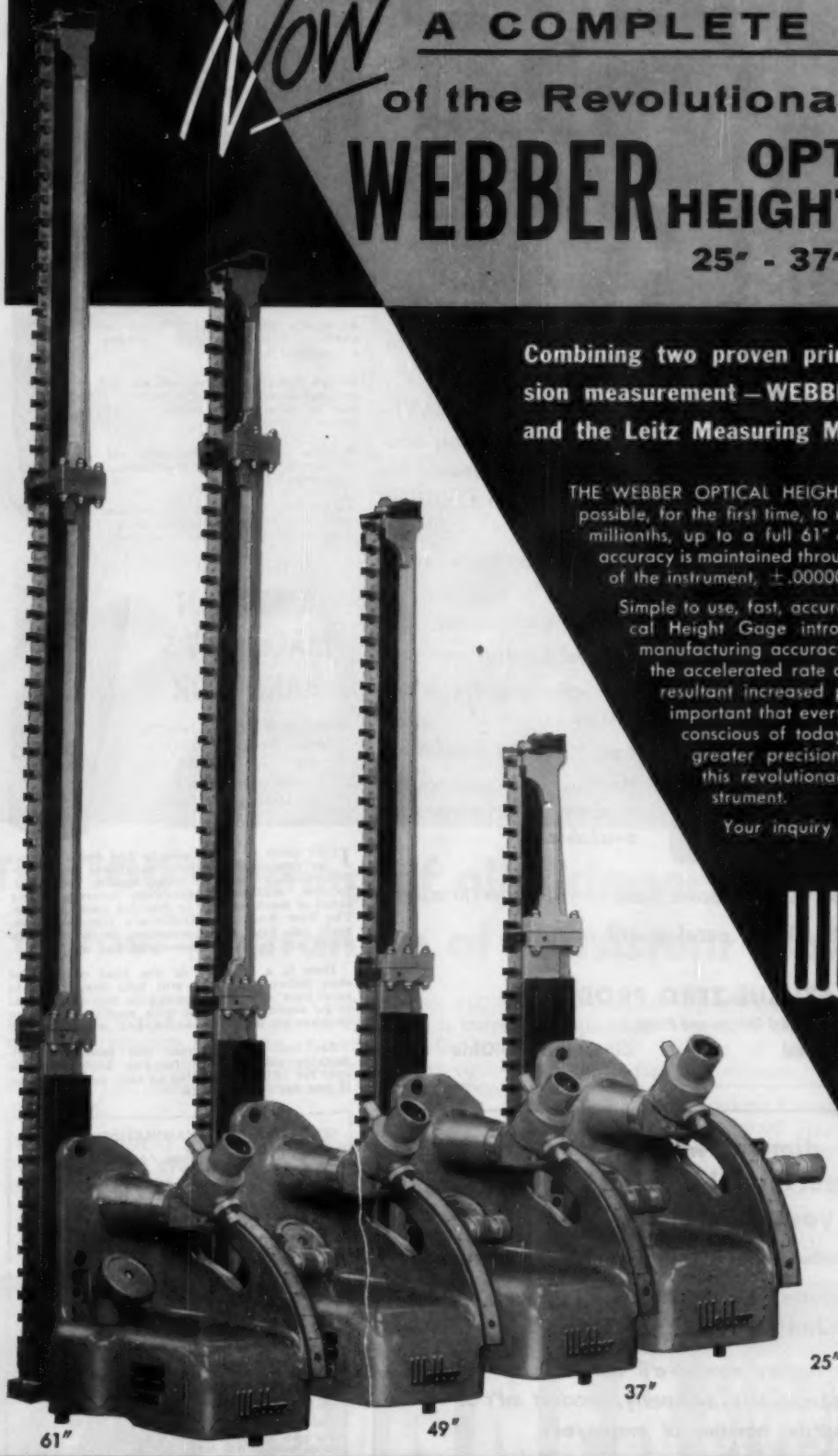
Now

A COMPLETE LINE

of the Revolutionary New

WEBBER OPTICAL HEIGHT GAGES

25" - 37" - 49" - 61"



Combining two proven principles of precision measurement — WEBBER Gage Blocks and the Leitz Measuring Microscope —

THE WEBBER OPTICAL HEIGHT GAGE has made it possible, for the first time, to make measurements in millionths, up to a full 61" of height. Its fantastic accuracy is maintained throughout the entire length of the instrument, ±.000005" per inch of length.

Simple to use, fast, accurate, the WEBBER Optical Height Gage introduces a new era of manufacturing accuracy. The saving of time, the accelerated rate of production, and the resultant increased profits make it vitally important that every manufacturer who is conscious of today's trend toward even greater precision get the facts about this revolutionary new measuring instrument.

Your inquiry is invited.

Webber GAGE CO.

12901 TRISKETT RD. CLEVELAND 11, OHIO

Webber MICRO-ACCURATE Gages

LARGEST EXCLUSIVE MANUFACTURERS OF GAGE BLOCKS

GIVE METALS A COLD TREAT

with this NEW low cost **Cincinnati Sub-Zero** Mechanical Chilling Machine

STABILIZE ALLOY STEEL by complete change of austenite to martensite.

TOUGHEN METALS, increase hardness and life of perishable tools up to 400%.

STRESS-RELIEVE CASTINGS of magnesium, aluminum and cast iron . . . with SUB-ZERO Chilling!

- **Capacity: 400 BTU's per hr. at −120° F.**
- **2 cubic foot chamber**
- **All steel construction**
- **Hermetically sealed refrigeration system**
- **Easy "Plug-in" installation**
- **Heating unit, observation window, other accessories available.**

Complete range of model sizes. Custom built to your specifications.

WRITE TODAY for catalog and test data.

Cincinnati

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General Offices and Plant

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What leading magazines say about this book:

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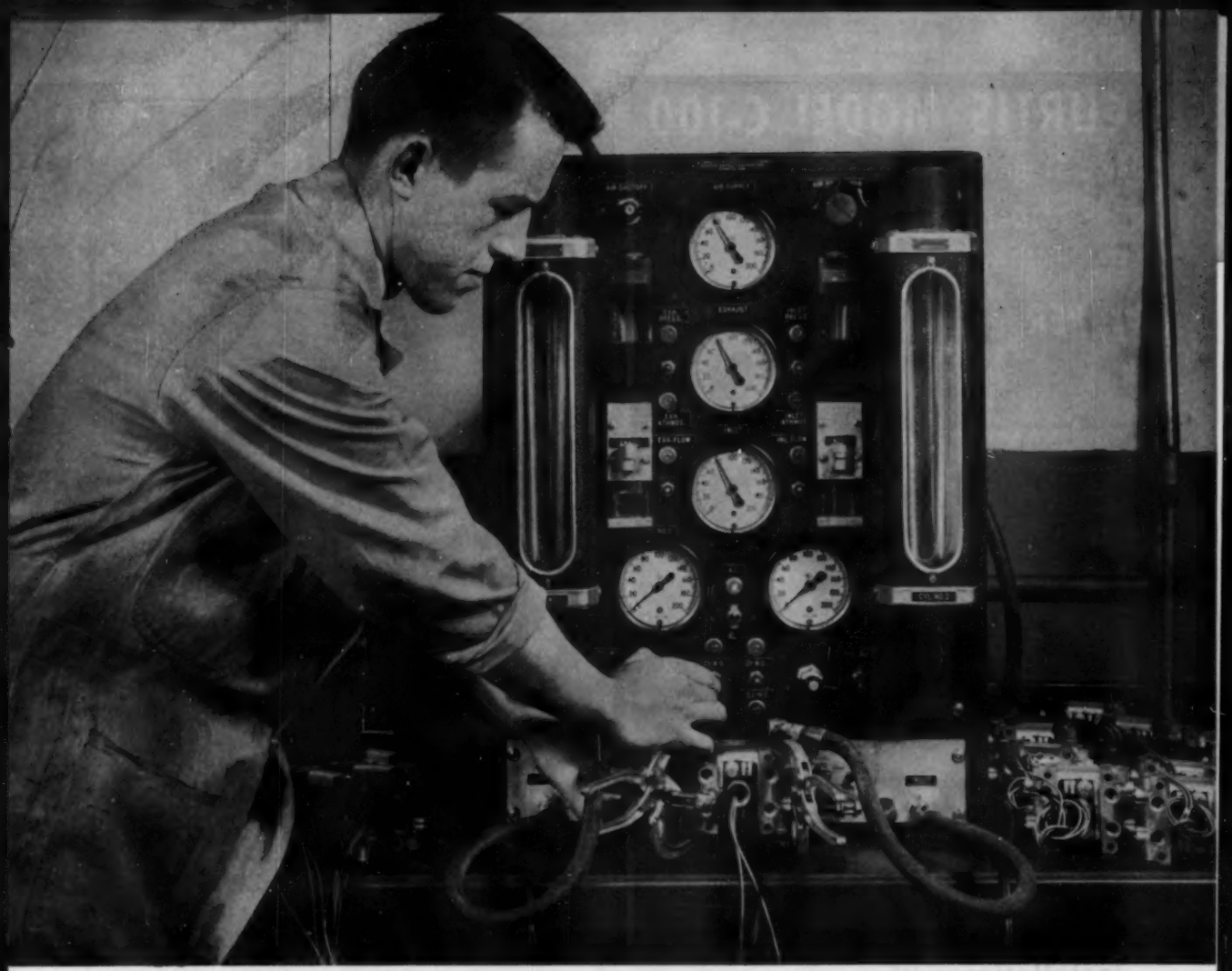

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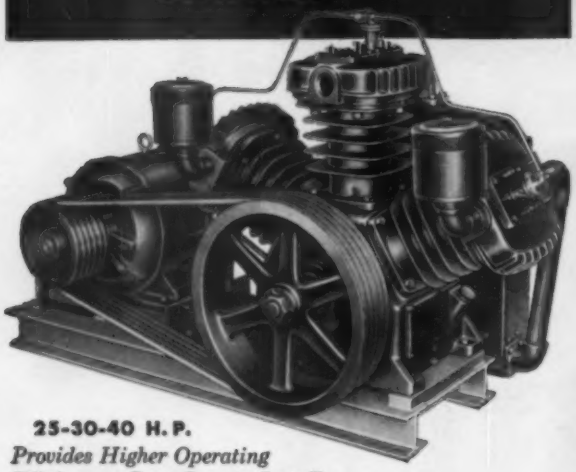

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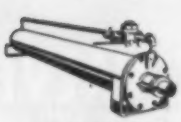
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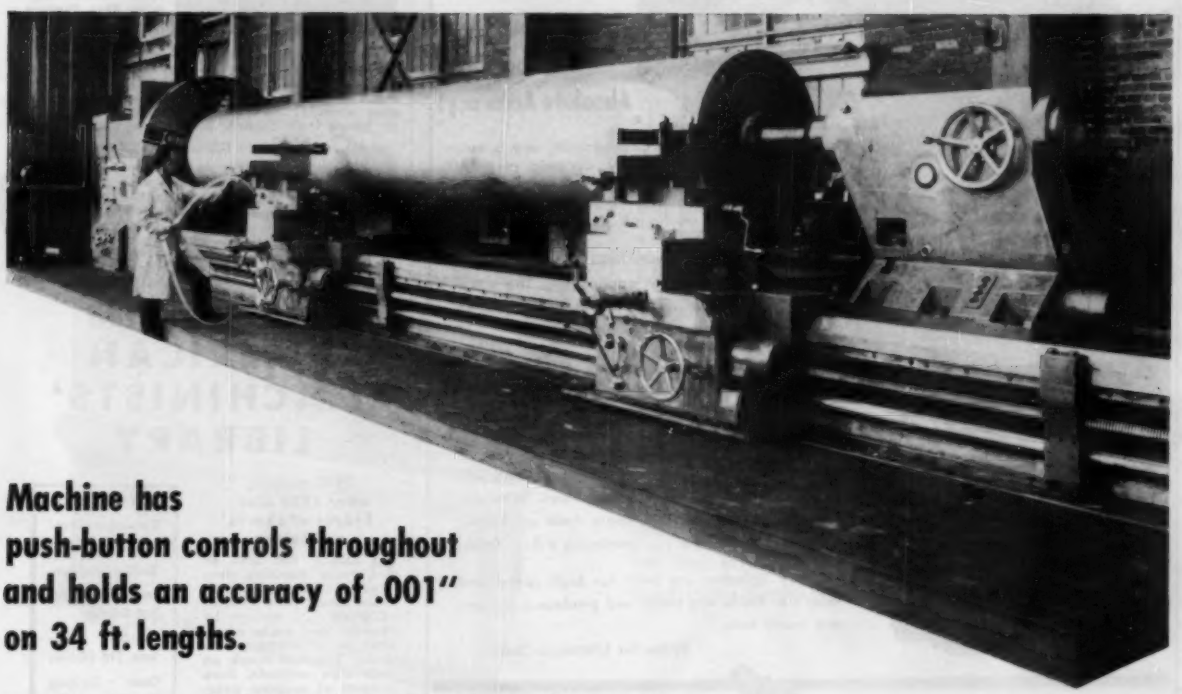

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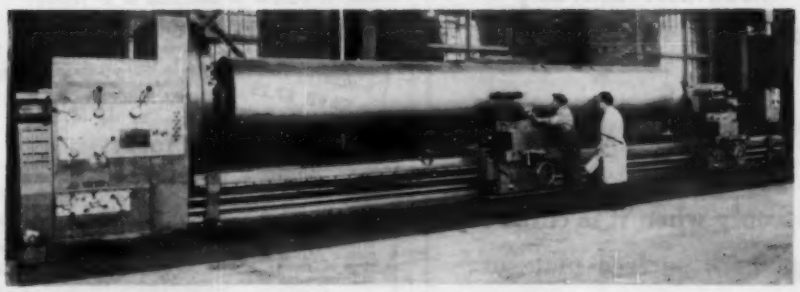

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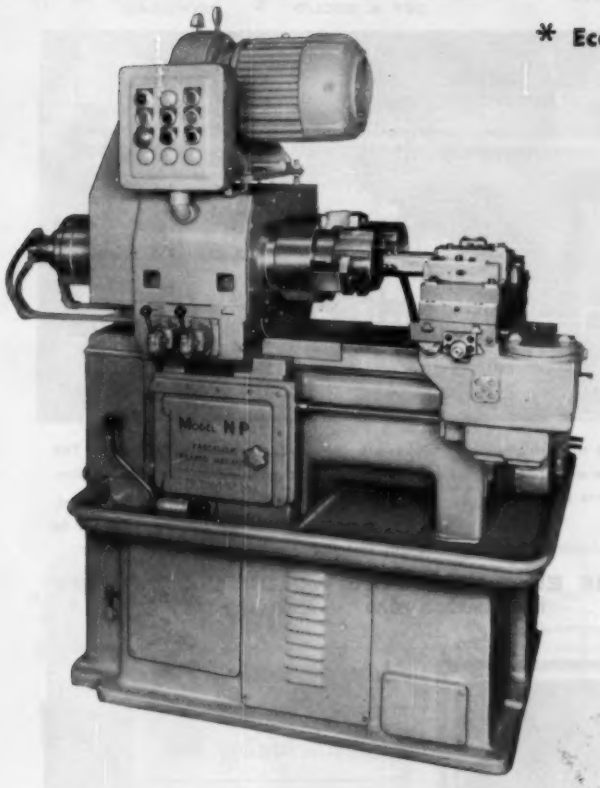

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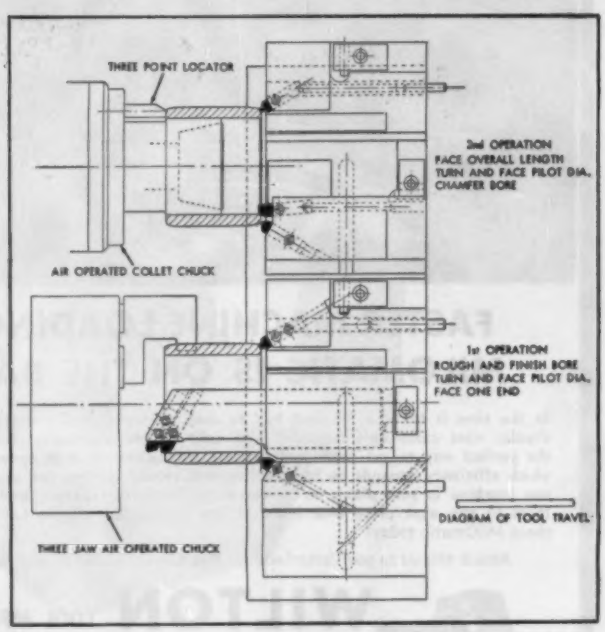

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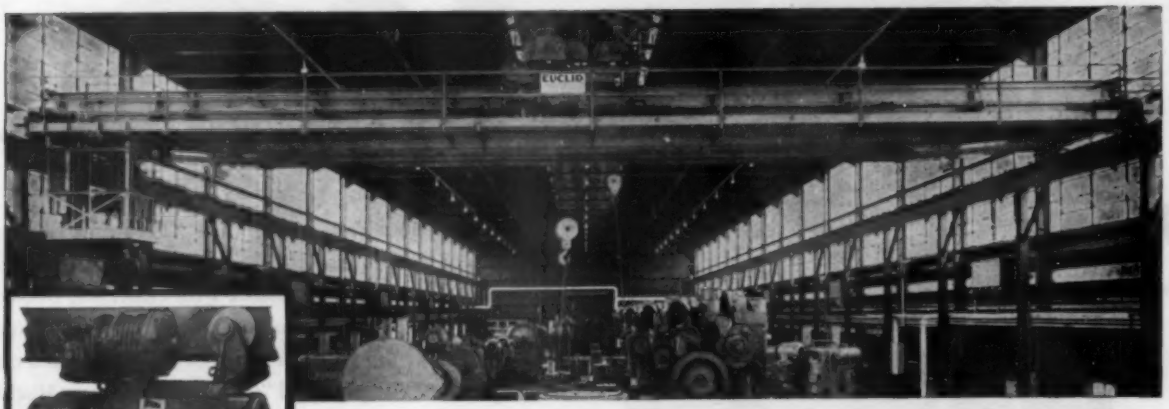

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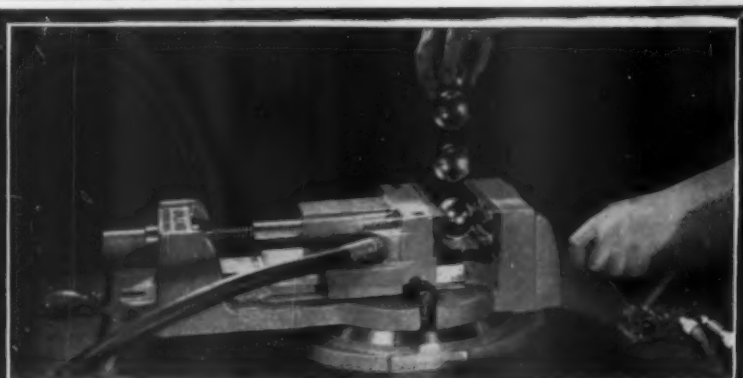

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•**A sharp upturn in the number of used machinery auctions** has been evident in the last few weeks out on the West Coast, particularly in the Los Angeles-San Diego area, which has been heavily affected by the government's recent drastic cutbacks in aircraft and guided missile production.

Several dealers out there report that they're attending an average of two auctions a week, and indicate that if they had the time they could attend one every day.

The increase in auctions indicates that it's the small jobbing machine shop, the one that leans heavily on subcontract work from the big aircraft primes, that's really getting it in the neck because of the cutbacks. Aside from the cutbacks, the aircraft primes and the big subcontractors are retrenching by pulling work back into their shops, leaving the subcontractor out in the cold. Some bankruptcies are reported, and other machine shops are being forced out, or just plain scared out, of business.

At these auctions, used machinery dealers from the area and from other cities are shying away from buying expensive precision equipment because they find there's scarcely any demand for that type of machinery.

Too, there have been noticeable drops in sales of large turret lathes and grinders in used machinery salesrooms. In consequence, dealers are exceedingly cautious about adding to their inventories of such machines.

Price drops have been in evidence in recent weeks, with one dealer reporting (*AM* Sept 9 '57 p101) that a four-spindle drill press, which sold for $1000 just a couple of months back, is now price-tagged at $800.

•**Seems like an old (and slightly illegal)** English auction custom has made its way across the Atlantic to U S machinery auctions. The technique, as described fully in Wolf Mankewitz's book, *"Make Me An Offer,"* is called the "Knockout" in England.

By way of keeping prices down at auctions, dealers over here have been forming bidding combines. Say there's a tool going at auction that would be worth $2000 when it's fixed up and resold in a dealer's showroom. Half a dozen dealers are interested. They appoint one of their number to bid $600 top for it as is.

The dealer gets the bid. After the auction, all six of them get together and "knock it out," i.e., starting at the base bid price of $600, each dealer bids over that. Now, if the top overbid is $200, the other five dealers split the overbid money—$200 divided by five, or $40 each. That way, a dealer can make himself a few bucks even if he loses the tool. The dealer who gets the machine gets a good price, and everybody's happy except the auctioneer and seller.

Sounds great, except that practically every top auctioneer in the country is wise to it by now. You can get away with it once or twice, but as in the case of recent West Coast auctions, the auctioneer caught on fast, refused to let the equipment go, shipped it East for sale.

•**Of all used machinery experiencing healthy sales** at the moment, small machines for sheet metalworking seem to be doing best. But it depends upon your clientele. While some dealers in, say, heavy machinery producing areas, report only fair sales of sheet metal fabricating machines, others in light manufacturing and construction areas say they can hardly keep up with the demand for presses, brakes, rolls and shears.

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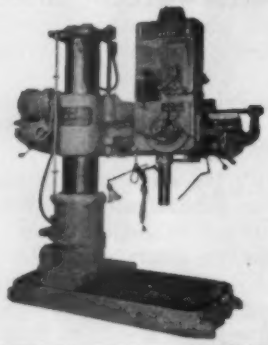

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3W WATERBURY FARREL Hi-Speed Blanking, 60 Tons Cap., 1½" Stroke, Reeves Drive.

No. 18, 19, 20, 21 Bliss O.B.I. Press.

GRINDERS

28" x 12' centers, FARREL Traveling Table Type Roll Grinder, New in 1942. Excellent condition.

6" x 18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System, Late Type.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS Tool Grinder, MD, Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

No. 5 BROWN & SHARPE Hyd. Surface Grinder 8" x 24", Late Type.

MISCELLANEOUS

18 KW SCIENTIFIC ELECTRIC Induction Heater, Tube Type.

No. 13 BROWN & SHARPE Univ. Tool & Cutter Grinder, Late Type.

No. 175 SCHMIDT M.D. Hyd. Power Marking Machine, Late Type.

No. 3, 5 MITTS & MERRILL, No. 5 Davis Keyseaters, M.D.

No. 194 BARNES Vertical Hone, 4" Capacity, 12" Stroke, M.D.

20" ROCKFORD Model SA Hydraulic Vertical Slotter, New 1953.

8" CLEVELAND Model A Automatic Screw Machine, Late Type.

No. 9 MARVEL Heavy-Duty Hack Saw 10" x 10" Cap. M.D. Late Type.

6' x 10 ga. Parker Power Squaring Shear, M.D. Late Type.

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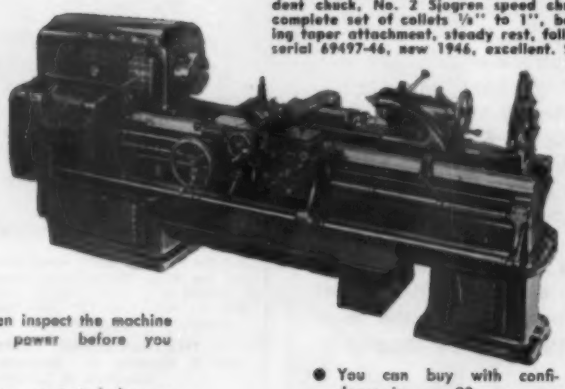
16"-18½" x 54" cc American Pacemaker Lathe, 10 H.P. 220/440 motor in base, 18 spindle speeds, 17-1000 R.P.M., 4-Jaw independent chuck, No. 2 Sjogren speed chuck with complete set of collets ⅛" to 1", ball bearing taper attachment, steady rest, follow rest, serial 69497-46, new 1946, excellent. $8350.00



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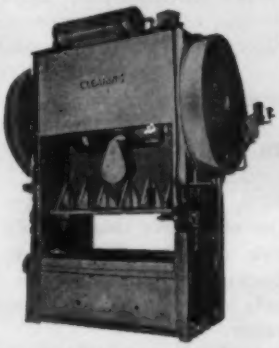

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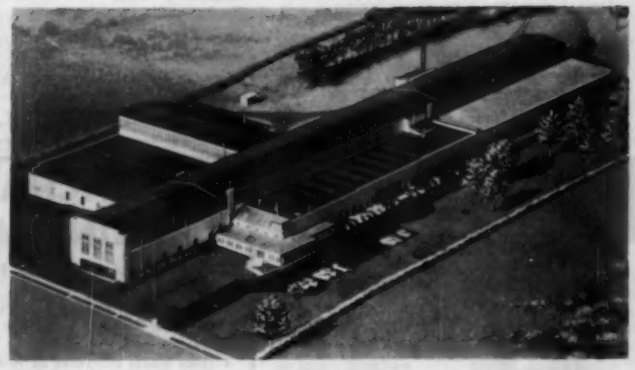

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CABLE ADDRESS EMCO

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1500-TON BLISS SINGLE ACTION STRAIGHT SIDE HYDRAULIC PRESS
Serial:—#110085
Area of Bed:—49" RL, 48" FB
Maximum Stroke:—15"
Daylight:—35"
Press Speed Inches Per Minute
Quick Advance 395", Pressing 13", Return 320"
Working Pressure:—2650# Per Sq. Inch
Bolster:—7½" Thick
Northern Pump:—#5630—Capacity:—66 GPM
60 HP, 685 R.P.M. Main Motor, 3 HP, 1150 R.P.M. Auxiliary
Motor with Double Shaft Extension, 440 Volt, 3 Phase, 60 Cycle
Overall Height:—22'3"

500-TON HPM SINGLE ACTION STRAIGHT SIDE HYDRAULIC PRESS (FASTRAVERSE)
Serial:—#46-357
Area of Bed:—36" x 36"
Daylight:—42"
Cushion:—166 Tons
325 Gallon Reservoir
100 H.P. Westinghouse Motor 220/440, 3 Phase, 60 Cycle

200-TON CLEARING SINGLE ACTION STRAIGHT SIDE CRANKLESS PRESS
Model:—F-1200-42
Serial #41-5444
Area of Bed:—44" RL x 38" FB
Maximum Stroke: 30"
Shunt Height:—24"
Motor 25 HP, 220/440 Volt, 3 Phase, 60 Cycle
Strokes Per Minute:—Up to 35
Floor Space:—107" x 84" x 196" High
Weight:—35 Ton

125-TON BLISS #306 STRAIGHT SIDE PRESS
Model:—#306
Serial:—#7685
Area of Bed:—25" RL x 26" FB
Bolster:—3" Thick
Stroke:—9¾"
Shut Height:—21½" To Bolster
Ram Area:—20" RL x 22" FB
Air Cushion and Cylinder
Fairbanks Morse Motor:—15 HP 3/60/220
Push Button Station

FS-5497, American Machinist, Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

Eastman 14" Comparator & gear analyzer.
Gleason 3" Str. Bevel Gear Generator.
Besley No. 372 Disc Grinder, 1947.
B & S No. 2 Surface Grinder, 1934.

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TG636 J & L Serial 110793. Excellent condition — relieving attachment — abundance of tooling and accessories—two wheel dresser heads — Universal and Pantograph. Price: $15,000.00.

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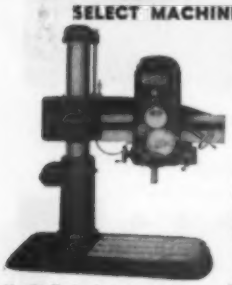

3'11" column American Helewizard Radial Drill, motor on head, 12 speeds, late type.

4'11" column American Helewizard Radial Drills, motor on head, 12 speeds, late type.

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BORING MILLS, 4" Sellers, Thle Type, Late
8" bar Yoder, Table Type, 1944
10' Niles Vertical, 2 Hds. M.D.
36" & 24 Bullards, New Era Type
5" Sellers Thle Type, Late
GRINDERS No. 36 Hanchett Vert. Rotary, 44
36" x 42" P. & W. Vert. Surf., '47
60" Hanchett Vert. Spin. Surf., No. 300
10" x 20" B. & S. No. 1 Univ., 1942
LATHES, 36" x 21' con. N.B.P. Grd. Hd., T.A.
25" x 40" con. LeBlond, 31" sw., '41
18"x28" con. Sidney, T.A., 18½" sw., 1952
TURRETS, Nos. 2L, 5 & 3 Gisholts, Late
Nos. 2 W. & S. & 2 & 2G Moreys, Late
MILLERS, No. 3A B. & S. Univ. Tim.
No. 4B K. & T. Vert., Table 102" x 19" oversize
RADIAL DRILLS, 6'10" col. Carlton, M.D.

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CHOICE MACHINE TOOLS

K & T 1404 Prod. Mill 1949
CINN. 1-18 Prod. Mill 1951
TOCCO 200 KW, 3,000 cy. 1943
TOCCO 80 KW, 10,000 cy. 1943
GISHOLT #3 Air Chuck & Cyl. 1943
WARNER & SWASEY 2A Bar Feed 1946

3" AJAX Air Clutch Upsetter, 1947
CINCINNATI 5-54 duplex broach, 1948
LAPOINTE, Vert. Broach 20T, 90" st. 1941
CINN. Cyl Grinder 6x18 Plunge 1945
CINN. Cyl. Grinder, 10x18 Plunge 1941
CINN. Cyl. Grinder, 16x72 Plunge 1943
CINCINNATI 1066 horizontal 2-way, 1948
EXCELLO #33 Thread Grinder 1942
NORTON Cyl. Grinder, 6x18 Plunge 1944
HANCHETT #900 Face Grinder 1944
ROCKFORD Hyd. Vert. Shaper, 12" st. 1944
GRAY DH Planer, 60x60x12, 4 heads, DC drive
BETTS DH Planer, 64x64x16, 4 heads, DC drive
SUMMER & ADAMS Thread Mill, 18", H.S. 1943
BIGNALL & KEELER 6" pipe threader, 1940
BIGNALL & KEELER 12" pipe threader, 1940
BIRDSBORO hydraulic straightening press, 600 ton, 60x72 bed, 18" stroke, 36" daylight (3) 1942

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New REED-PRENTICE No. 4 Vertical Millers available for quick delivery—at reduced cost. Exclusive *electronic* controls for all feeds. Unsurpassed for precision milling. Write for descriptive folder and prices on 60" and 96" models.

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6" x 3/8" 12' x 3/4"
18" x 3/4" 20' x 1"

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6" x 6" x 1" cap.

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LANDIS (Landmaco) 1½" Bolt Threader; 4 heads lead screw; cap. ½" to 1½".
LANDIS (Landmaco) 2½" Bolt Threader; double head; cap. ½" to 2½"; lead screw.

BORING MACHINES

BULLARD, New Era type, 24".
GIDDINGS & LEWIS, Model 25T, 2½" Bar—60" to Outboard.
KEARAS, 3" Bar—66" to Outboard.
UNIVERSAL, 3" Bar—72" to Outboard.
WEBSTER—BENNETT, 36".

BORING MILLS

COLBURN 62" Ver., 2 swivel heads on rail; swing 65"; 50" under rail; Power Rapid Traverse; speeds 1 to 35 RPM.
COLBURN 72" Ver., 2 swivel heads on rail; swing 75"; 56" under rail; Power Rapid Traverse; speeds 1 to 35 RPM.

BRAKES — PRESS

CINCINNATI, Model 50, 12 ft, Cap 90 tons—12 ga.

DRILLS—RADIAL

AMERICAN 4' arm 11" col. "Triple Purpose"; motor on arm.
AMERICAN 7' arm 16" col. "Triple Purpose"; motor drive; late type.
CINCINNATI BICKFORD 2½' arm 7½" col. "Super Service"; motor on arm.
CINCINNATI BICKFORD 4' arm 9" col. "Super Service"; motor on arm; double end base.
FOSDICK 6' arm 17" col. "Economax"; motor on arm.
GSP 3' arm 10" col., motor on arm—new 1955.
MORRIS 3' arm 11" col. MOR-SPEED; motor on arm.

GEAR EQUIPMENT—FELLOWS

FELLOWS 3"; fine pitch; late type.
FELLOWS Type 645-A-3; high speed; late type.
FELLOWS 61A; high speed; late type.
FELLOWS 824; high speed; late type.
FELLOWS #7; high speed; late type.
FELLOWS #72; high speed; late type.
FELLOWS #712; high speed; late type.
FELLOWS #725A; high speed; late type.
FELLOWS #715A; high speed; late type.
FELLOWS #7125; high speed; late type.
FELLOWS 6Z2; high speed; late type.

GRINDERS—UNIVERSAL

BROWN & SHARPE #1, 10"x20" centers; late type.
BROWN & SHARPE #2, 14"x30" centers; Machine new 1954—NEVER USED.
BROWN & SHARPE #3, 14"x40" centers; late type.
BROWN & SHARPE #4, 14"x60" centers; late type.
CINCINNATI 16"x72" centers, Model ER; late type.
LANDIS 14"x36" centers, Type C; late type.
LANDIS 16"x36" centers, Type C; late type.

GRINDERS—PLAIN CYLINDRICAL

BROWN & SHARPE 10"x36" centers, Model 22; late type.
CINCINNATI 4"x12" centers; Type H; late type.
LANDIS 6"x18" centers; Type C; late type.
LANDIS 10"x36" centers; D.C.; late type.
LANDIS 10"x72" centers; D.C.; late type.
LANDIS 10"x96" centers; Type C; late type.
LANDIS Type "C", 10" x 96", Hydraulic.
LANDIS Type "B", 16" x 216" Hydraulic.
LANDIS 25"x72" centers; Type D; CRANKPIN; late type.
LEMPCO 22"x84" centers; Model KGC, CRANKSHAFT; late type.
NORTON 6"x30" centers, Type C; late type.
NORTON 6x18" centers, Type C; late type.
NORTON 10"x18" centers, Type C; late type.
NORTON 14"x72" centers, Type C; late type.
NORTON 16"x48" centers, Type C; late type.
NORTON 18"x72" centers, Type C. CRANKSHAFT REGRINDER; late.
VAN NORMAN Model 418—New 1954—NEVER USED.

GRINDERS—CYLINDRICAL UNIVERSAL

NORTON 14" x 48", Multi-Purpose, Hydraulic

GRINDERS — INTERNAL

HEALD Model 72-A-5, Hydraulic.

GRINDERS — SURFACE HORIZONTAL

MATTISON 20" x 24" x 72", Hydraulic.

GRINDERS — SURFACE, VERTICAL

HANCHETT, Model 60-400, Hydraulic, Table 60" x 16".

LATHES—ENGINE

AMERICAN, Model "T", 24" x 240".
AMERICAN 18" x 30" cc "Pacemaker"; 3-jaw chuck; speeds 17 to 1000 RPM.
DENHAM 18/36"x48" centers; late type.
DIMCO 16"x40" centers; late type.
HENDEY 14"x102" centers; late type.
HENDEY 16/24"x30" centers; late type.
HENDEY 16"x54" centers; late type.
LEBLOND 16"x102" centers; late type.
LEBLOND 18"x78" centers; late type.
LEBLOND 24"x84" centers "REGAL"; late type.
LEBLOND 24"x96" centers "REGAL"; late type.
LEBLOND 30"x60" centers; heavy duty; motor drive.
LODGE & SHIPLEY 14"x30" centers; late type.
LODGE & SHIPLEY 16" x 30" cc; 3-jaw chuck; Taper Attachment; speeds 16 to 485 RPM.
LODGE & SHIPLEY 16" x 30" cc; Model "X"; Taper Attachment; speeds 9 to 500 RPM.
LODGE & SHIPLEY 27" x 54" cc; Taper Attachment; speeds 7 to 198 RPM.
LODGE & SHIPLEY 16" x 54".
MONARCH 10"x20" centers Model EE; late type.
MONARCH 12"x30" centers, Model CKK; late type.
MONARCH 16"x30" centers, Model CY; late type.
MONARCH 18"x72" centers, Model CBB; late type.
MONARCH, Model CY, 16" x 54", Tool Room.
NILES BEMENT POND 120"x96" centers; Heavy Duty; 2 carriage motor drive.
PRATT & WHITNEY 16"x30" centers; Model C; late type.
REED-PRENTICE, Model "A", 20" x 54".

LATHES—TURRET

ACME Model 6R Univ. Ram Type; bar feed; cap. round 2-9/16"; swing 21"; speeds 30 to 600 RPM.
ACME Model 35 Univ. Saddle Type; bar feed; rapid traverse; collet cap. round 4⅛"; swing 26¼"; speeds 9 to 266 RPM.
GISHOLT #1L Univ., Saddle Type; late type.
GISHOLT #2L Univ., Saddle Type; late type.
GISHOLT #3 Ram Type Chucking; late type.
GISHOLT #4 Pre-selector; Ram Type Chucking; late type.
GISHOLT #5 Pre-selector Bar or Chuck; late type.
JONES & LAMSON #3 Univ. Ram Type; bar feed cap. round 1½"; swing 21"; speeds 20 to 1000 RPM.
LIBBY #LH-12 Saddle Type; 12 holes; late type.
MOREY #3 Ram Type; Bar & Chucking; New 1954
POTTER & JOHNSTON #4D Chucking; late type.
WARNER & SWASEY #1 "ELECTRIC"; late type.
WARNER & SWASEY #1A Univ., Saddle Type Chucking; late type.
WARNER & SWASEY #2A Univ., Saddle Type Chucking; late type.
WARNER & SWASEY #3A Univ., Saddle Type Chucking; late type.

LATHES—MANUFACTURING

GISHOLT #12 Automatic; late type.
H.E.B. 17"x40" centers; Tracer—new 1955.
JONES & LAMSON "FAY" 8"x15" centers; late type.
JONES & LAMSON 20"x25" centers; late type.
LEBLOND 9"x30" centers; Model 7AC CRANKSHAFT; motor drive.
LEBLOND 42"x26' Single end Boring.
LIPE "CARBO" 12"x18" centers; late type.
MONARCH 14"x42" centers, Model Z; Magnamatic; late type.
PRATT & WHITNEY #1—½Bx81", 2 spindle Deep Hole; late type.
PRATT & WHITNEY #1—½Bx102", 2 spindle Deep Hole; late type
SUNDSTRAND 12"x22"; late type.

MILLING MACHINES

BROWN & SHARPE #2 Univ.; table 42¾" x 8¼"; long. travel 25", transverse 9", ver. 12", dividing head; tailstock; belted motor drive.
Cincinnati #4 Univ., Medium Speed, Dial Type; Table 78½" x 16¼" long, travel 42", cross 14", ver. 20"; speeds 19 to 450 RPM; with dividing head.
INGERSOLL Adjustable Rotary type; dis. 42"; travel of saddle 40".
CINCINNATI #4 Pl., Med. Speed; Dial Type; table 78½" x 16¼"; long. travel 42", cross 14", vertical 20"; speeds 18 to 450 RPM.
CINCINNATI #5 Plain High Power, table 82" x 21"; long. travel 50", cross 14"—ver. 21"; speeds 16 to 442 RPM; with dividing head; Rapid Traverse.

MILLING MACHINES—PLAIN, HORIZONTAL

CINCINNATI 0-8 Auto. rise and fall; late type.
CINCINNATI 2-24 Auto. rise and fall, late type.
CINCINNATI 3-24 "HYDROMATIC"; late type.
CINCINNATI #3 High Speed Dial; late type
CINCINNATI 5-48 "HYDROMATIC"; hydraulic tracing head; late type.
CINCINNATI 45-60 "DUPLEX", Hydromatic; late type.
KEARNEY & TRECKER #2H high speed; late type.
U.S. Model MJ 1-8 Multi-Miller; late type.

MILLING MACHINES — HORIZONTAL — UNIVERSAL

KEARNEY & TRECKER No. 3KM.
KEARNEY & TRECKER No. 3H.
KEARNEY & TRECKER No. 4H.

MILLING MACHINES — HYDROTEL

CINCINNATI 36" x 120", Horizontal.

MILLING MACHINES — VERTICAL

KEARNEY & TRECKER No. 3H.
KEARNEY & TRECKER No. 4H.
BETTS (Consolidated) 60" x 80" x 16' double housing; box table; 4 heads; DC reversing drive; Power Rapid Traverse; 80" under rail.
BETTS (Consolidated) 72" x 72" x 18' double housing; box table; 4 heads; DC reversing drive; Power Rapid Traverse; 86" under rail.
NILES BEMENT POND 120" x 96" x 18' double housing; box table; Power Rapid Traverse; 136" between Housings; 99" under rail.
CINCINNATI Model "Hydro" 36" x 36" x 8' Double Housing.

PLANERS

NILES BEMENT POND 48" x 48" x 14' double housing; box table; 4 heads; DC reversing motor drive.
NILES BEMENT POND 60" x 60" x 14' double housing; box table; 4 heads; DC reversing motor drive.
NILES BEMENT POND 60" x 60" x 16' double housing; box table; 4 heads; DC reversing motor drive.

SHAPERS & SLOTTERS

BETTS (Consolidated) Ver. Slotter; 3 head Locomotive Frame; stroke of rams 40"; distance between housing 74"; under bridge 44".

SHAPERS & SLOTTERS — HORIZONTAL

HENDEY 24", Standard, Crank Type Shaper.
GOULD & EBERHARDT 24", Universal Industrial Shaper.

SHAPERS & SLOTTERS — VERTICAL

JONES 12" Shaper.

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CINCINNATI Type 2508, All Steel Power Squaring.

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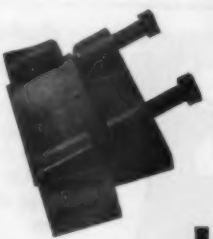

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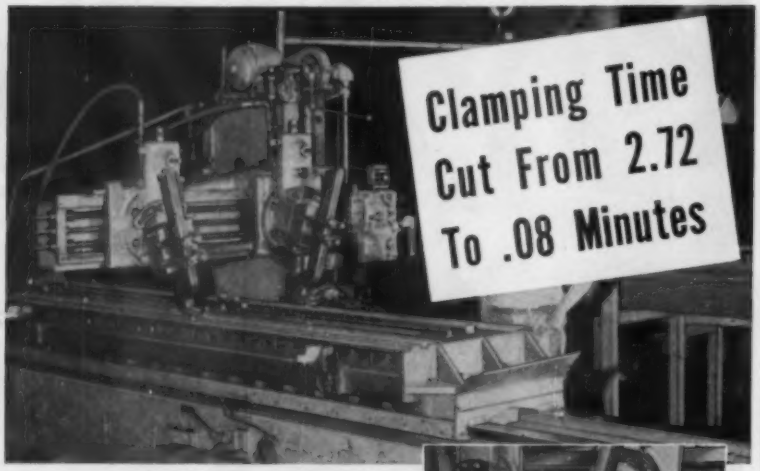

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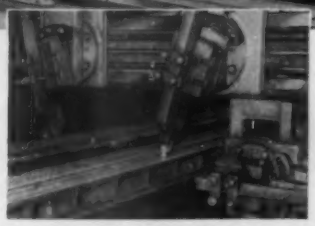

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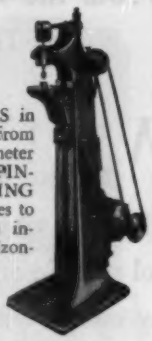

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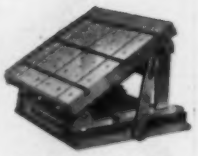

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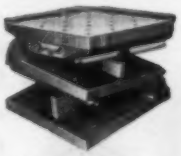

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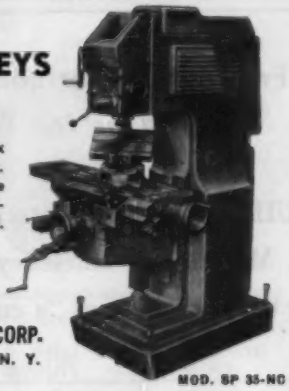

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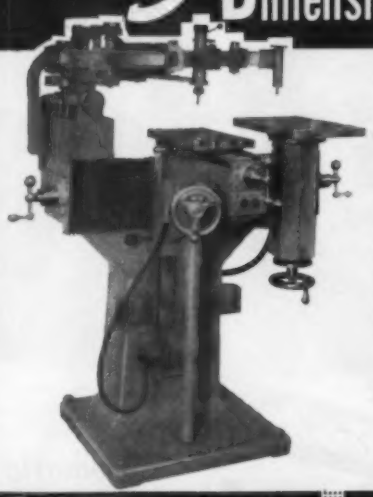

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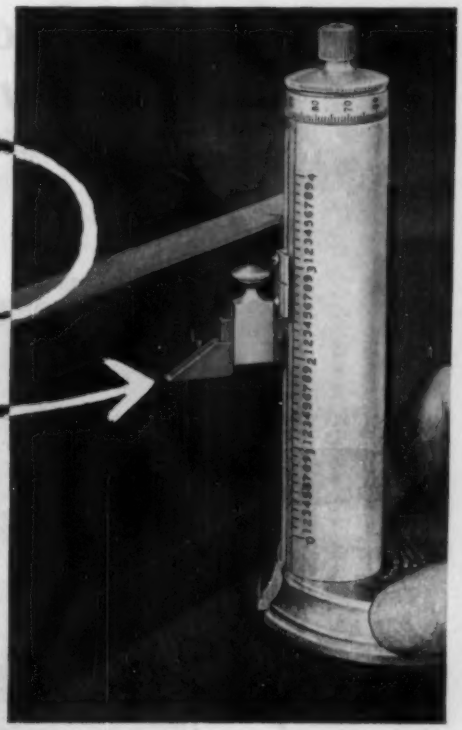

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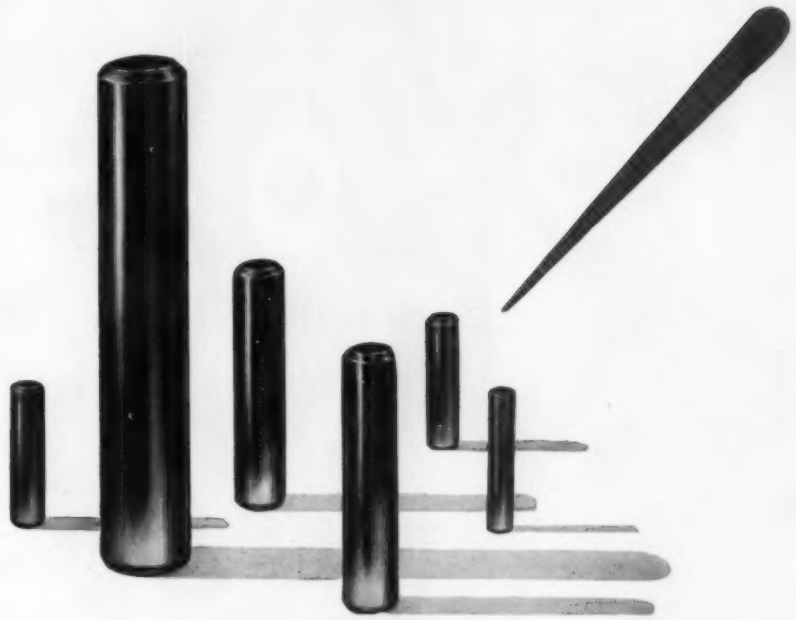

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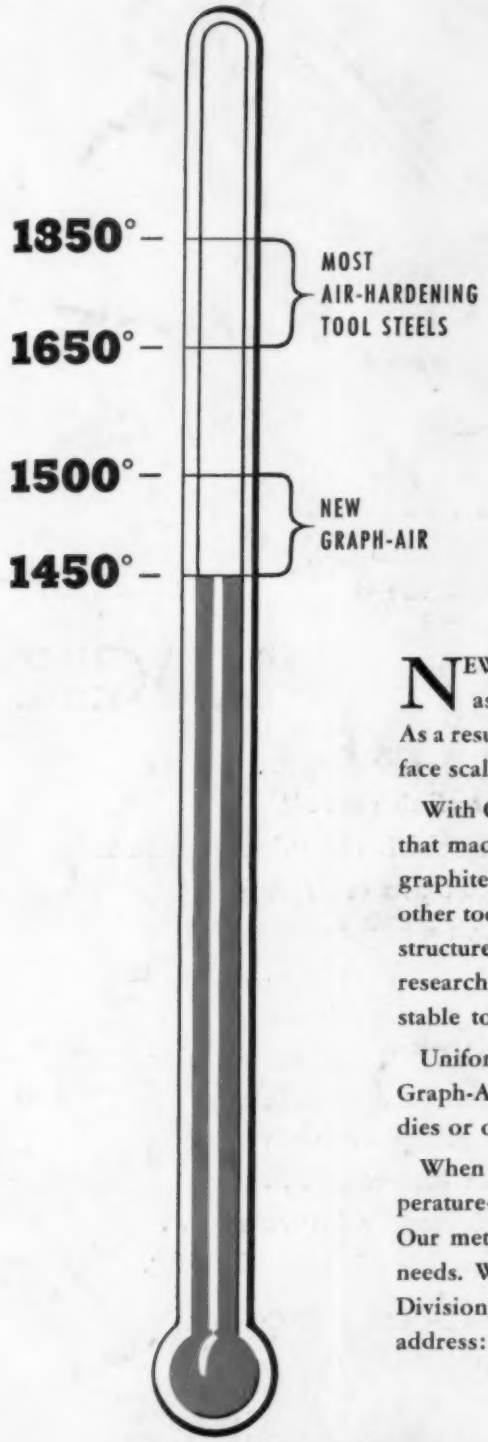

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